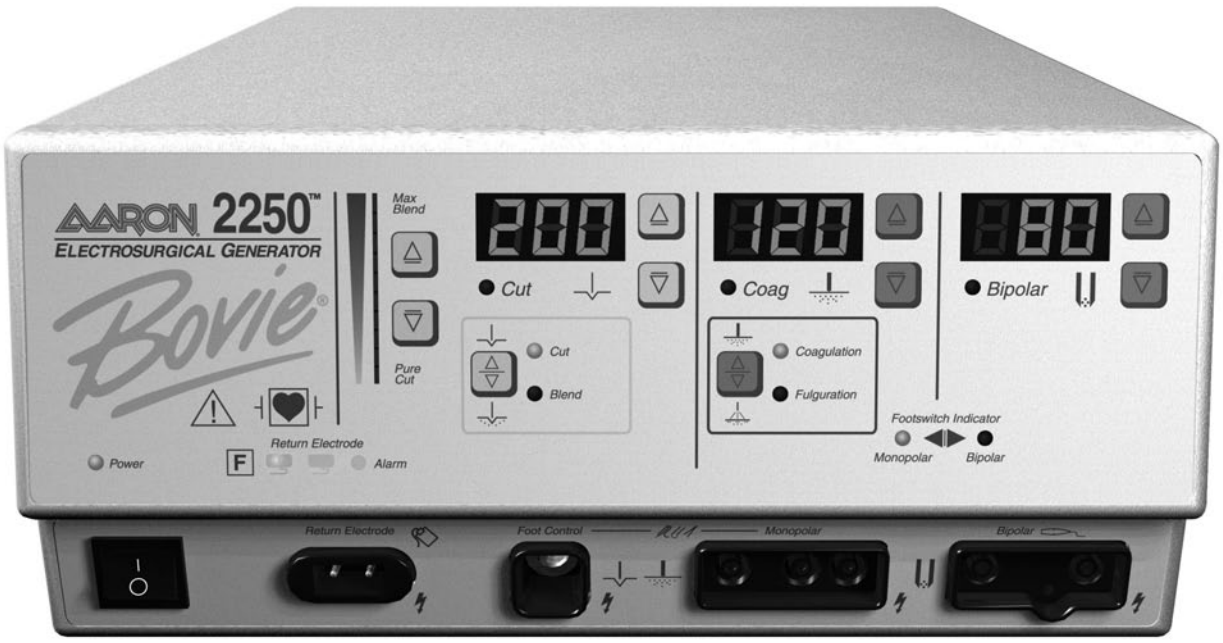
Bovie®

AARON® 2250™

ELECTROSURGICAL GENERATOR



SERVICE GUIDE

This Service Guide and the equipment it describes are for qualified technicians who maintain and repair the Aaron 2250 Electrosurgical Generator. Additional User information is available in the *Aaron 2250 User's Guide*.

This document covers technical descriptions of the Aaron 2250 including its physical appearance, all operator controls and indications, operational specifications, component functional descriptions (module level), diagrams of the electronic circuits used, and troubleshooting guidelines (with chart comparisons).

The Aaron 2250 was constructed with the highest quality components, and was built in an ISO 9001 registered environment. In the unlikely event that your generator fails within one year of purchase date, Aaron Medical will warranty the product and effect factory repairs. Please refer to *Appendix A Warranty* for what is covered, length of coverage, and *Obtain a Return Authorization Number* in *Section 8*.

Equipment Covered in this Manual

Aaron 2250:
Reference No: A2250

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SAFETY PRECAUTIONS WHEN OPERATING THE GENERATOR

The safe and effective use of electrosurgery depends to a large degree on factors solely under the control of the operator. There is no substitute for a properly trained and vigilant medical staff. It is important that they read, understand, and follow the operating instructions supplied with this electrosurgical equipment.

To promote the safe use of the Aaron 2250, please refer to the User's Guide for standard operating precautions.

APPLICABLE SAFETY STANDARDS

CSA C22.2, NO. 601.1 - M90
UL 2601 - 1 - UL
IEC 60601 - 2 - 2 (2001-09) Part 1-2
CENELEC EN 60601 - 1 Part 1
IEC 60601 - 2 - 2 (1998-09) Part 2-2
IEC 60601 - 1 Part 1

CONVENTIONS USED IN THIS GUIDE

WARNING:
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION:
Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE:
Indicates an operating tip, a maintenance suggestion, or a hazard that may result in product damage.

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BOARD DRAWINGS AND SCHEMATICS

SECTION 1

THE AARON 2250

This section includes the following information:

- *Functional Description*
- *Unit Description*
- *Safety Precautions when Repairing the Generator*

CAUTIONS:
Read all warnings, cautions, and instructions provided with this generator before using.

Read the instructions, warnings, and cautions provided with electrosurgical accessories before using. Specific instructions are not included in this manual.

FUNCTIONAL DESCRIPTION

The Aaron 2250 is a multipurpose electrosurgical generator for use in physician's offices and surgi-centers. This unit offers unsurpassed performance, flexibility, reliability, and user convenience.

The Aaron 2250 includes digital technology. This new technology is evident in the self-checking circuitry and error code readouts. The unit offers monopolar and bipolar electrosurgical operations.

The following are Aaron 2250 key advantages and benefits:

- **Power Capabilities**
  Up to 200 watts of pure cut in the Cut mode @ 300 Ω
  Up to 200 watts of Blend @ 300 Ω
  Up to 120 watts of Pinpoint @ 500 Ω
  Up to 80 watts of Spray @ 500 Ω
  Up to 80 watts of Bipolar @ 150 Ω

- **Cut Mode**
  The cut mode gives the surgeon flexibility to cut all types of tissue without losing performance.
  The Cut mode generates constant output power over a wide range of impedances. Refer to the *Technical Specifications* section of this guide.

- **Blend with 10 Settings**
  The Blend mode is a combination of Cutting and Hemostasis. The 2250 gives the surgeon freedom to adjust the desired level of hemostasis. A setting of 1 is minimal blend with maximum cutting effect. A setting of 10 is maximum hemostasis (blend) with minimal cutting effect. This adjustment is easily achieved by a incremental adjustment. Refer to Section 2, *Controls, Indicators, and Receptacles, Cut and Blend Controls*. The Blend mode improves the rate of targeted tissue desiccation without increasing the power delivered by the generator.

- **Two levels of coagulation: Pinpoint and Spray**
  Pinpoint provides precise control of bleeding in localized areas.
  Spray provides greater control of bleeding in highly vascular tissue over broad surface areas.

- **Return electrode sensing and contact quality monitoring**
  The 2250 incorporates a return electrode contact quality monitoring system (Bovie NEM™). This system detects the type of return electrode: solid or split. The system also continually monitors the contact quality between the patient and the split return electrode. This feature is designed to minimize patient burns at the return electrode site.

- **FDFS™ (Fast Digital Feedback System)**
  The FDFS™ (Fast Digital Feedback System) measures voltage and current at 5,000 times a second and immediately adjusts the power to varying impedance during the electrosurgical procedure. The unit's digital technology senses and responds to changes in tissue and density. Unlike analog, this feature reduces the need to adjust power settings manually.

  NOTICE:
  The Bovie NEM™ system recommends that you use a split return electrode.

- **Isolated RF output**
  This minimizes the potential of alternate site burns.

- **Standard connectors**
  These connectors accept the latest monopolar and bipolar instruments. Refer to *Section 2, Controls, Indicators, and Receptacles* to learn more.

- **Self diagnostics**
  These diagnostics continually monitor the unit to ensure proper performance.

UNIT DESCRIPTION

The Aaron 2250 is a self-contained unit, consisting of the main enclosure and power cord. The main components incorporated in the generator include:

- **Front Panel Components** Power switch; membrane switches to control power output and mode selection; receptacles for connecting electrosurgical accessories; and indicators that show the current settings, patient return electrode status, and footswitch status.
- **Rear Panel Components** Volume control; bipolar and monopolar footswitch receptacles; power cable receptacleand fuse holder; equipotential grounding stud; and remote accessory receptacle.
- **Internal Components** Display board; main board; speaker board; relay board; power supply; and cables.

SAFETY PRECAUTIONS WHEN REPAIRING THE GENERATOR

Before servicing the Aaron 2250, it is important that you read, understand, and follow the instructions supplied with the generator. Also, be familiar with any other equipment used to install, test, adjust, or repair the generator.

General Warnings, Cautions, and Notices

WARNINGS:

Use the generator only if the self-test has been completed as described. Otherwise, inaccurate power outputs may result.

The instrument receptacles on this generator are designed to accept only one instrument at a time. Do not attempt to connect more than one instrument at a time into any given receptacle. Doing so will cause simultaneous activation of the generator.

CAUTIONS:

Do not stack equipment on top of the generator or place the generator on top of any electrical equipment. These configurations are unstable and/or do not allow adequate cooling.

Provide as much distance as possible between the electrosurgical generator and other electronic equipment (such as monitors). An activated electrosurgical generator may cause electrical interference with them.

Do not turn the activation tone down to an inaudible level. The activation tone alerts the surgical team when an accessory is active.

NOTICES:

If required by local codes, connect the generator to the hospital equalization (grounding) connector with an equipotential cable.

Connect the power cord to a wall receptacle having the correct voltage. Otherwise, product damage may result.

Active Accessories

WARNINGS:

Shock Hazard - Do not connect wet accessories to the generator.

Shock Hazard - Ensure that all accessories and adapters are correctly connected and that no metal is exposed.

CAUTIONS:
Accessories must be connected to the proper receptacle type. In particular, bipolar accessories must be connected to the Bipolar Instrument receptacle only. Improper connection may result in inadvertent generator activation.

Set power levels to the lowest setting before testing an accessory.

NOTICE:
During bipolar electrosurgery, do not activate the generator until the forceps have made contact with the patient. Product damage may occur.

Fire / Explosion Hazards

WARNINGS:

Explosion Hazard – Do not install the generator in the presence of flammable anesthetics, gases, liquids, or objects.

Fire Hazard – Do not place active accessories near or in contact with flammable materials (such as gauze or surgical drapes). Electrosurgical accessories that are activated or hot from use can cause a fire. Use a holster to hold electrosurgical accessories safely away from personnel and flammable materials.

Fire Hazard – Do not use extension cords.

Fire Hazard – For continued protection against fire hazard, replace fuses only with fuses of the same type and rating as the original fuse.

Generator Electric Shock Hazards

WARNINGS:
Connect the generator power cord to a properly grounded receptacle. Do not use power plug adapters.
Do not connect a wet power cord to the generator or to the wall receptacle.
To allow stored energy to dissipate after power is disconnected (caps discharge), wait at least five minutes before replacing parts.
Always turn off and unplug the generator before cleaning.
Do not touch any exposed wiring or conductive surfaces while the generator is disassembled and energized. Never wear a grounding strap when working on an energized generator.
When taking troubleshooting measurements use appropriate precautions such as using isolated tools and equipment, using the “one hand rule,” etc.
Potentially lethal AC and DC voltages are present in the AC line circuitry, high voltage DC circuitry, and associated mounting and heat sink hardware described in this manual. These potentials are not isolated from the AC line. Take appropriate precautions when testing and troubleshooting this area of the generator.
High frequency, high voltage signals that can cause severe burns are present in the RF output stage and in the associated mounting and heat sink hardware. Take appropriate precautions when testing and troubleshooting this area of the generator.

Servicing

CAUTIONS:
Read all warnings, cautions, and instructions provided with this generator before servicing.
The generator contains electrostatic-sensitive components. When repairing the generator, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized generator. Handle circuit boards by their nonconductive edges. Use an anti-static container for transport of electrostatic-sensitive components and circuit boards.

Cleaning

NOTICE:
Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.

SECTION 2

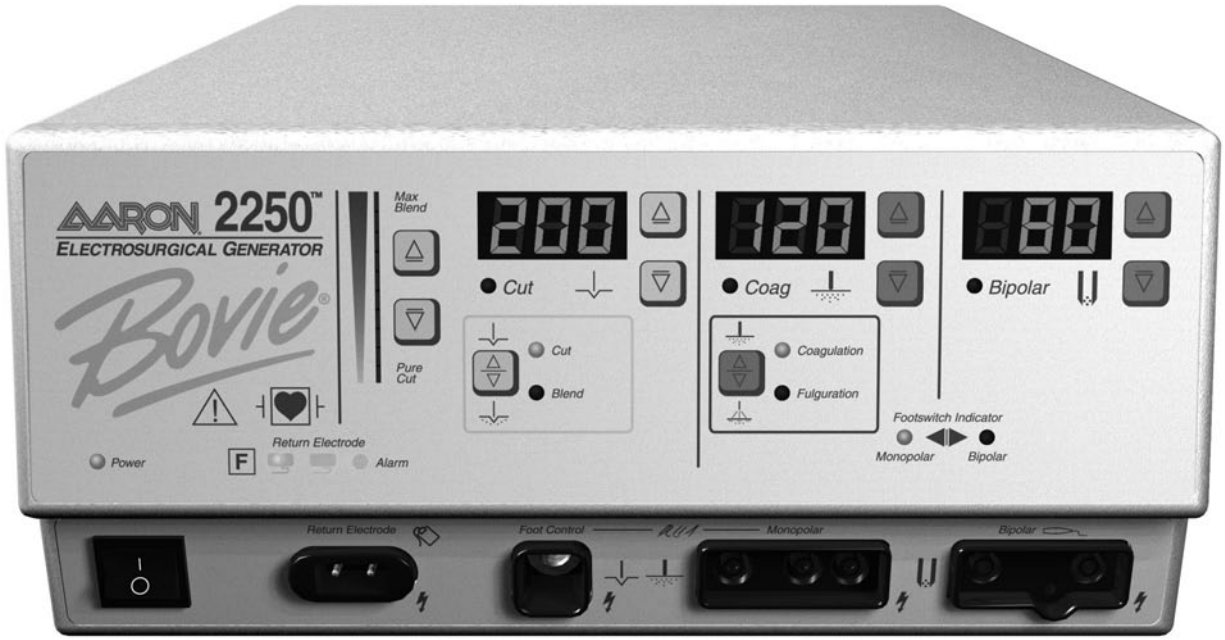
CONTROLS, INDICATORS, AND RECEPTACLES

This section describes:

- *The Front Panel*
- *Controls and Indicators Overview*
- *The Rear Panel*

FRONT PANEL

Figure 2 – 1 Layout of controls, indicators, and receptacles on the front panel



CONTROLS AND INDICATORS OVERVIEW

Users may control most Aaron 2250 functions from the front panel. Each control is plainly marked and colored on the front panel for quick reference. The volume control is located on the rear panel.

Normal operations involve activating the generator with either a front connected handswitch or footswitch. The following components are the User Interface for the Aaron 2250.

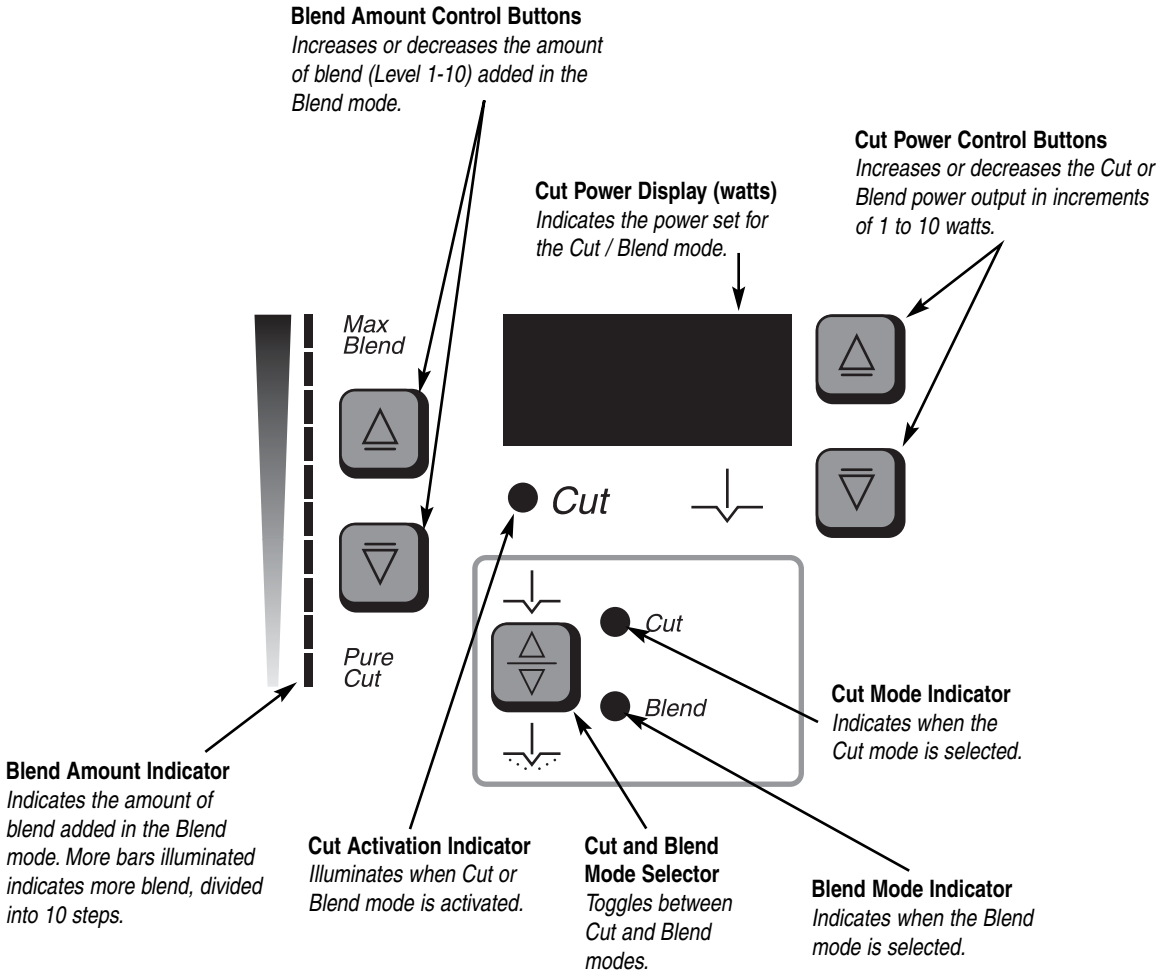
Power Switch	The rocker ON/OFF switch is located on the lower left corner allows the 2250 to be shut off when the unit is not in use.
Watts Displays (Cut, Coag, and Bipolar)	These large power output displays report the generator's output power settings from 1 to 200 watts in the Cut mode, 1 to 120 watts in the Coag mode, and 1 to 80 watts in the Bipolar mode all in one, five, or ten watt increments (at the rated load). During operation, the displayed number corresponds to the selected mode, indicating the available generator power to the surgeon.
Membrane Power, Presets, & Function Switches	The front panel overlay contains 10 membrane switches (sometimes called matrix switches). There is a membrane switch dedicated to each operational mode. These switches toggle the unit between functions (Cut, Blend, Coagulation, and Fulguration) and power settings (Cut, Coag, and Bipolar) in watts and blend settings indicated by a maximum to minimum illuminated bar).
Visual LED Indicators	Mode LEDs illuminate for Cut, Coag, Bipolar, Cut , Blend, Coagulation, and Fulguration settings on the front of the unit. The footswitch LEDs illuminates to indicate that the monopolar or bipolar footswitch is connected to the unit. The Power LED indicates if the unit is switched On. The red Alarm LED indicates that the unit has detected an error or no return electrode is attached to the generator. The green Return Electrode LEDs indicate the type of return electrode sensed by the Bovie NEM™.
Audible Indicators	An activation tone sounds whenever the 2250 is activated. The volume may be adjusted up or down on the rear of the unit. An Alarm Siren sounds during all alarm conditions. The volume of this alarm cannot be adjusted.

Symbols on the Front Panel

SYMBOLS	DESCRIPTION
Cut Controls	
	Cut Mode
	Blend Mode
Coag Controls	
	Coagulation Mode
	Fulguration Mode
Bipolar Controls	
	Bipolar Mode
Indicators	
	Split Return Electrode
	Solid Return Electrode
Regulatory Symbology	
	Read instructions before use.
	Defibrillator proof type CF equipment
	RF Isolated – patient connections are isolated from earth at high frequency.
Power Switch and Handpiece Connectors	
	Return Electrode Receptacle
	Caution High Voltage
	Cut Mode
	Coag Mode
	Monopolar Handpiece Receptacle
	Bipolar Mode
	Bipolar Handpiece Receptacle

Cut and Blend Controls

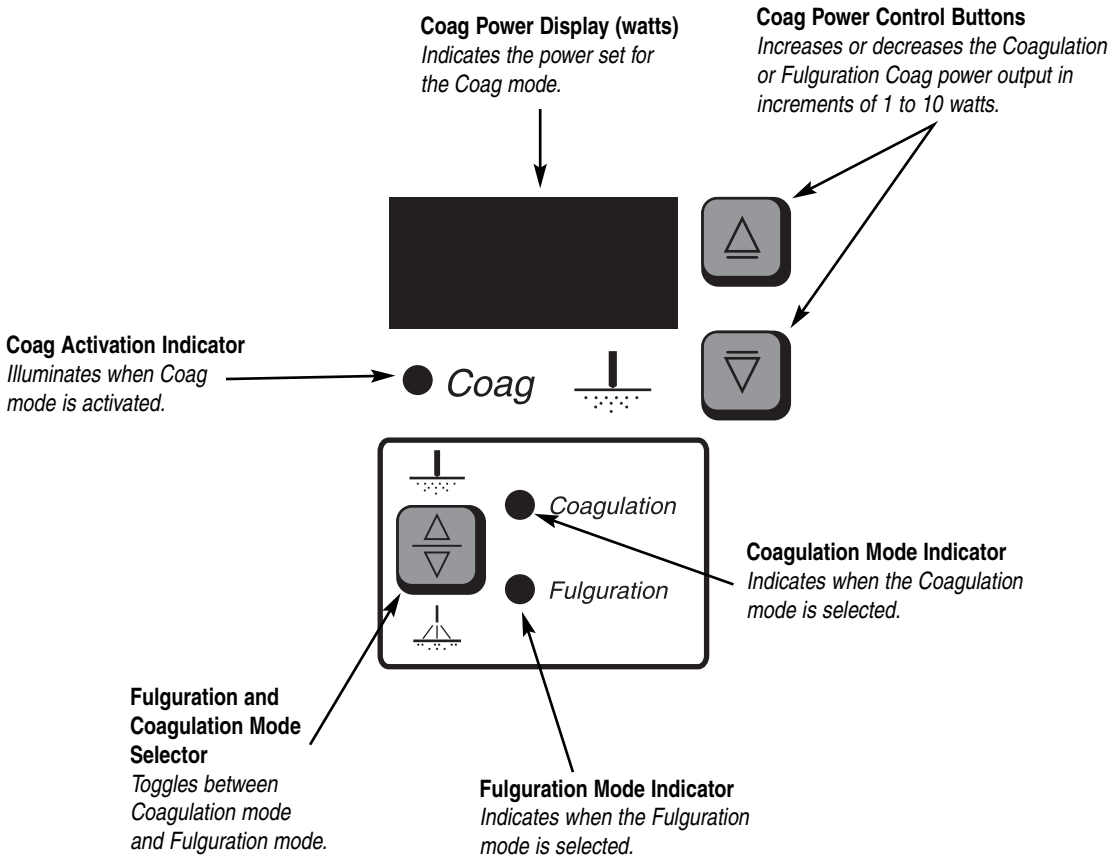
Figure 2 – 2 Controls for the Cut and Blend modes



NOTICE:
When selecting the Blend mode, the unit defaults to a setting of minimum blend (only the first bar is illuminated).

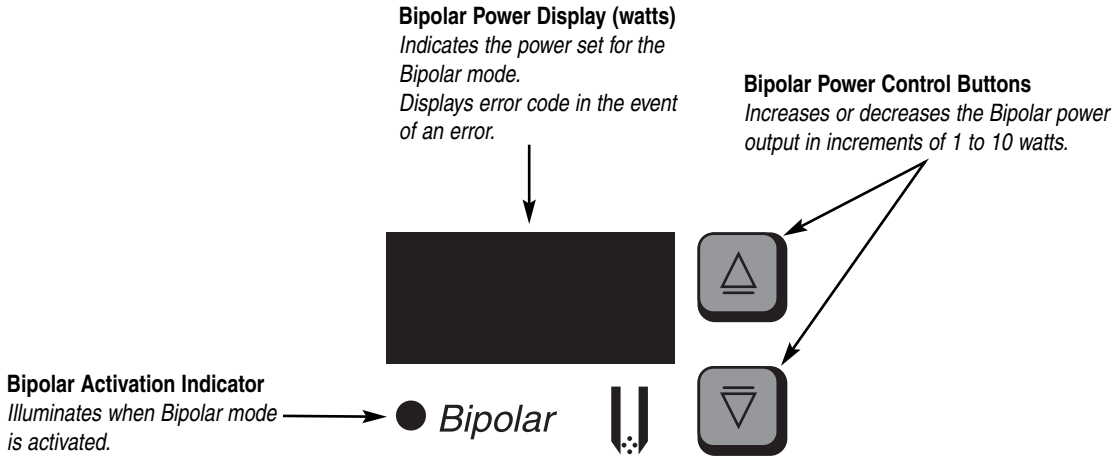
Coag Controls

Figure 2 – 3 Controls for the Coag mode



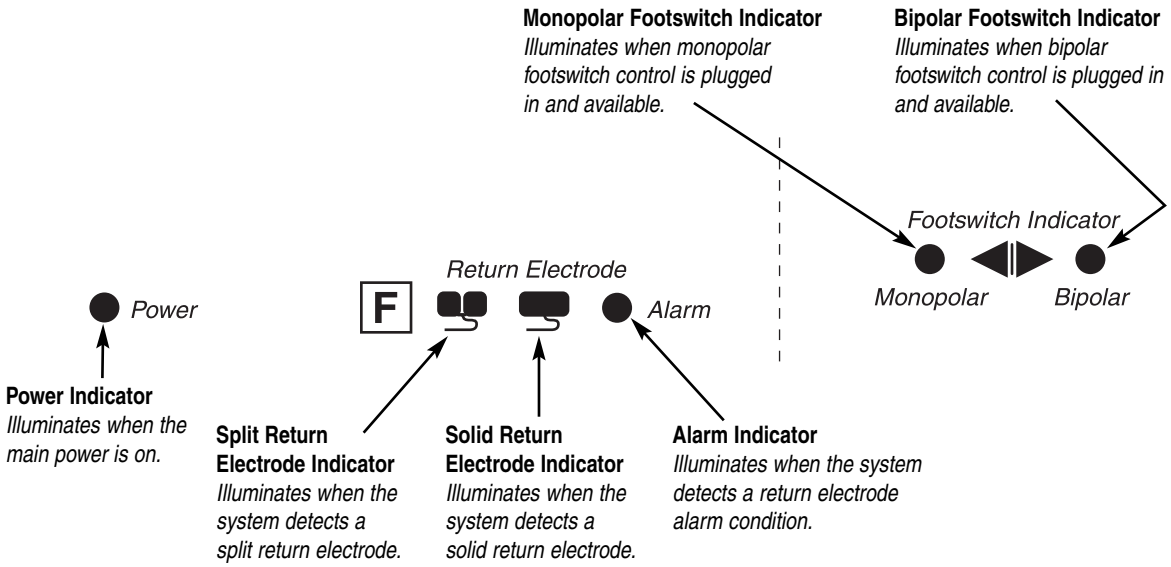
Bipolar Controls

Figure 2 – 4 Controls for the Bipolar mode



Indicators

Figure 2 – 5 Indicators for power, return electrodes, and footswitch control

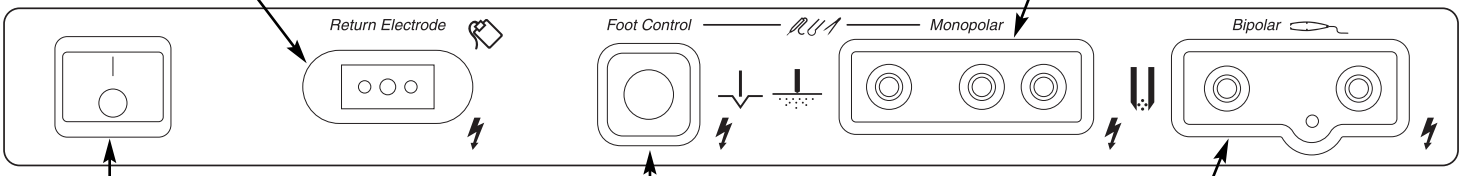


Power Switch and Receptacles

Figure 2 – 6 Location of the unit power switch and front panel receptacles

Return Electrode Receptacle
Accepts a standard return electrode plug.

Monopolar Handswitching Receptacle
Accepts standard 3-pin handpieces. Connect handswitching accessories.



Power On/Off Switch
Turns the unit on or off.

Monopolar Footswitching Receptacle
Accepts cables or adapters equipped with standard (Aaron #12) active plugs. Connect footswitching accessories.

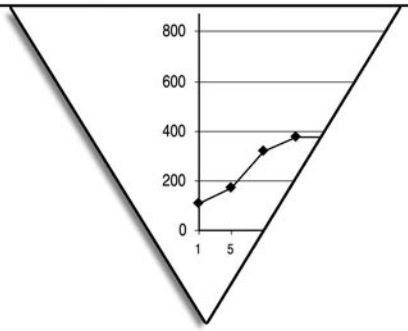
Bipolar Receptacle
Accepts standard cables for bipolar handpieces. Connect bipolar accessories.

REAR PANEL

Figure 2 – 7 Layout of connectors and controls on the rear panel

Symbols on the Rear Panel

SYMBOLS	DESCRIPTION
	Equipotential Ground Stud
	Non-ionizing Radiation
	Volume Control
	Danger - Explosion Risk If Used With Flammable Anesthetics.
	Fuse Enclosed
	Relay Connector
	Monopolar Footswitch Input Jack
	Bipolar Footswitch Input Jack
	Read Instructions Before Use



SECTION 3

TECHNICAL SPECIFICATIONS

All specifications are nominal and subject to change without notice. A specification referred to as “typical” is within ± 20% of a stated value at room temperature (25° C / 77° F) and a nominal input power voltage.

PERFORMANCE CHARACTERISTICS

Input Power

Input Voltage	100-240 VAC
Mains line frequency range (nominal):	50 / 60 Hz
Power consumption:	500 VA
Fuses (two):	6.3 A (slow blow)

Duty Cycle

Under maximum power settings and rated load conditions (Cut, 200 watt @ 300 ohm load), the generator is suitable for activation times of 10 seconds ON followed by 30 seconds OFF for one hour.

The internal temperature of the unit is continuously monitored. If the temperature rises above 85^0 C, the alarm will sound and output power will be deactivated.

Dimensions and Weight

Width	31.1 cm (12.25 in.)	**Depth**	41.3 cm (16.25 in.)
Height	15.3 cm (6.0 in.)	**Weight**	< 8.75 kg (< 19 lbs)

Operating Parameters

Ambient temperature range	10° to 40° C (50° to 104° F)
Relative humidity	30% to 75%, non-condensing
Atmospheric pressure	700 to 1060 millibars
Warm-up time	If transported or stored at temperatures outside the operating temperature range, allow one hour for the generator to reach room temperature before use.

Transport and Storage

Ambient temperature range	-34˚ to 65˚ C (-29˚ to 149˚ F)
Relative humidity	0% to 75%, non-condensing
Atmospheric pressure	500 hPa to 1060 hPa

Generator should fit on all standard Carts for monopolar generators. The device should be stored and used in a room temperature of approximately 77^0 F/25^0 C.

Audio Volume

The audio levels stated below are for activation tones (cut, coag, and bipolar) and alarm tones (return electrode and system alarms) at a distance of one meter. Alarm tones meet the requirements for IEC 60601-2-2.

Activation Tone

Volume (adjustable)	45 to 65 dB
Frequency	Cut: 1 kHz
	Blend: 1 kHz
	Coagulation: 2 kHz
	Fulguration: 2 kHz
	Bipolar: 2 kHz
Duration	Continuous while the generator is activated

Alarm Tone

Volume (not adjustable)	70 dB ± 5dB
Frequency	2 kHz ½ seconds / 1 kHz ½ seconds
Duration	2 seconds

Return Electrode Sensing

The system presents audible and visible alarms when it senses no return electrode.

Solid	Trip resistance: 0 Ω to 5 Ω ± 3 Ω Continuous measurement: Once the system establishes the solid return electrode resistance, an increase of 20 Ω ± 5 Ω in resistance will cause an alarm. When the alarm condition exists, the system deactivates output power.
Split	Trip resistance: 10 Ω ± 5 Ω to 135 Ω ± 10 Ω Continuous measurement: Once the system establishes the split return electrode resistance, an increase of 40% in resistance will cause an alarm. When the alarm condition exists, the system deactivates output power.

Low Frequency (50-60 Hz) Leakage Current

Enclosure source current, ground open	< 500 µA
Source current, patient leads, all outputs	Normal polarity, intact ground: < 10 µA Normal polarity, ground open: < 10 µA Reverse polarity, ground open: < 10 µA
Sink current at high line, all inputs	< 10 µA

High Frequency (RF) Leakage Current

Bipolar RF leakage current	< 63 mA $_{\text{rms at 80 watts}}$
Monopolar RF leakage current (additional tolerance)	< 150 mA $_{\text{rms}}$

STANDARDS AND IEC CLASSIFICATIONS

Class I Equipment (IEC 60601-1)

Accessible conductive parts cannot become live in the event of a basic insulation failure because of the way in which they are connected to the protective earth conductor.

Type CF Equipment (IEC 60601-1) / Defibrillator Proof

The Aaron 2250 provides a high degree of protection against electric shock, particularly regarding allowable leakage currents. It is type CF equipment. Patient connections are isolated from earth and resist the effects of defibrillator discharge.

Drip Proof (IEC 60601-2-2)

The generator enclosure is constructed so that liquid spillage in normal use does not wet electrical insulation or other components which, when wet, are likely to affect adversely the safety of the generator.

Electromagnetic Interference

When other equipment is placed on or beneath a Aaron 2250, the unit can be activated without interference. The generator minimizes electromagnetic interference to video equipment used in the operating room.

Electromagnetic Compatibility (IEC 60601-1-2 and IEC 60601-2-2)

The Aaron 2250 complies with the appropriate IEC 60601-1-2 and IEC 60601-2-2 specifications regarding electromagnetic compatibility.

Voltage Transients (Emergency Generator Mains Transfer)

The Aaron 2250 operates in a safe manner when the transfer is made between line AC and an emergency generator voltage source.

OUTPUT CHARACTERISTICS

Maximum Output for Monopolar and Bipolar Modes

Power readouts agree with actual power into rated load to within 20% or 5 watts, whichever is greater.

Mode	Output Power	Output Frequency	Repetition Rate	Vp-p max	Crest Factor* (Rated Load)
Cut	200 W @ 300 Ω	490 kHz ± 5 kHz	N / A	2500 V	1.6 ± 20%
Blend (Max)	200 W @ 300 Ω	490 kHz ± 5 kHz	30 kHz ± 5 kHz	3300 V	3.5 ± 20%
Coagulation	120 W @ 500 Ω	490 kHz ± 5 kHz	30 kHz ± 5 kHz	3500 V	4.5 ± 20%
Fulguration	80 W @ 500 Ω	490 kHz ± 5 kHz	30 kHz ± 5 kHz	7000 V	6.5 ± 20%
Bipolar	80 W @ 150 Ω	490 kHz ± 5 kHz	30 kHz ± 5 kHz	1000 V	1.6 ± 20%

Output Power Curves

The curves that follow depict the changes for each mode at specific power settings.

Figure 3 – 1 Output power vs impedance for Cut mode

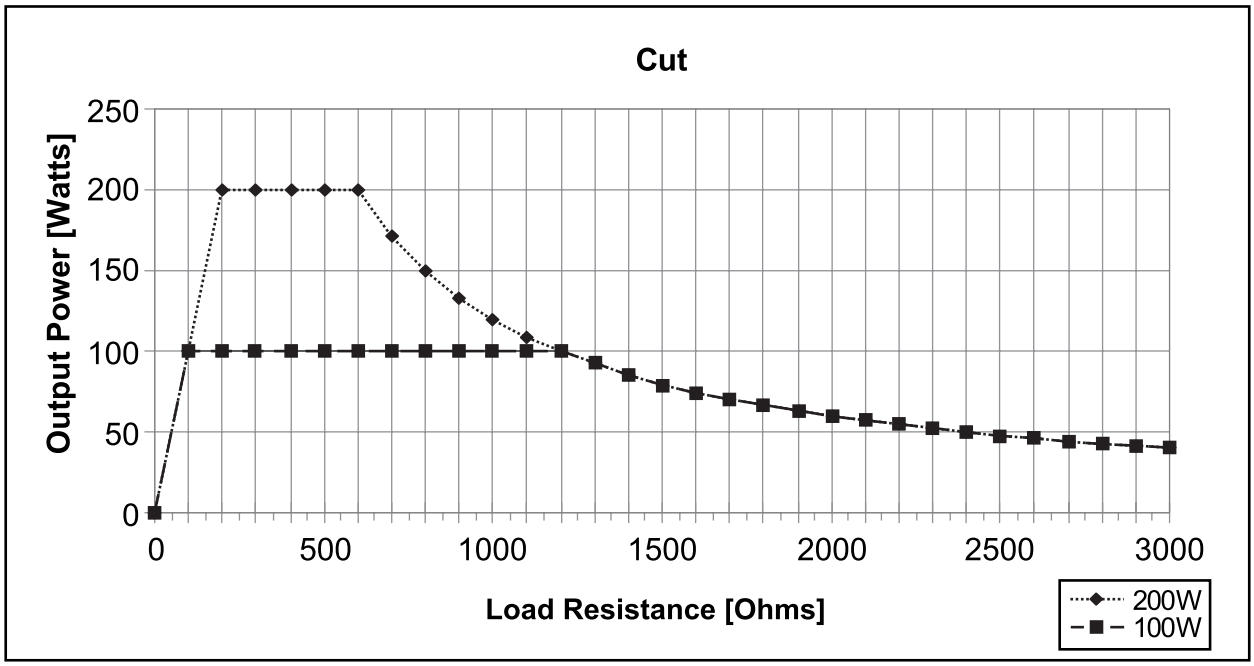


Figure 3 – 2 Output power versus impedance for Blend mode, set at Minimum.

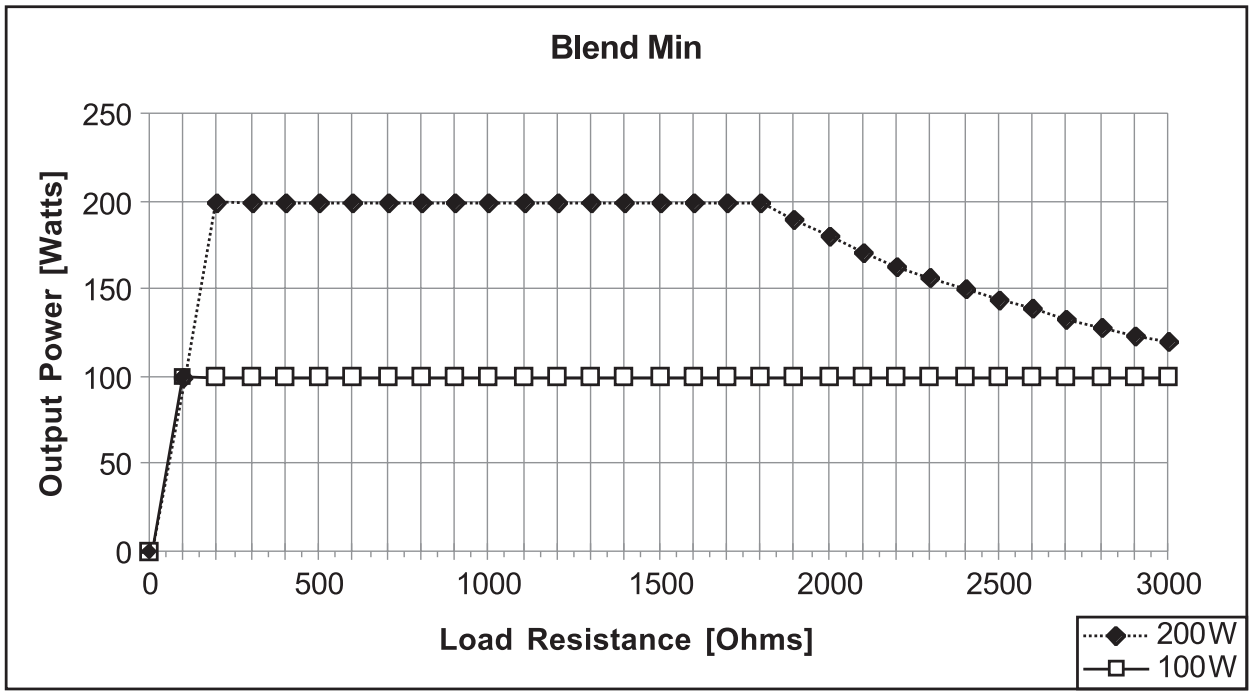


Figure 3 – 3 Output power versus impedance for Blend mode, set at Maximum

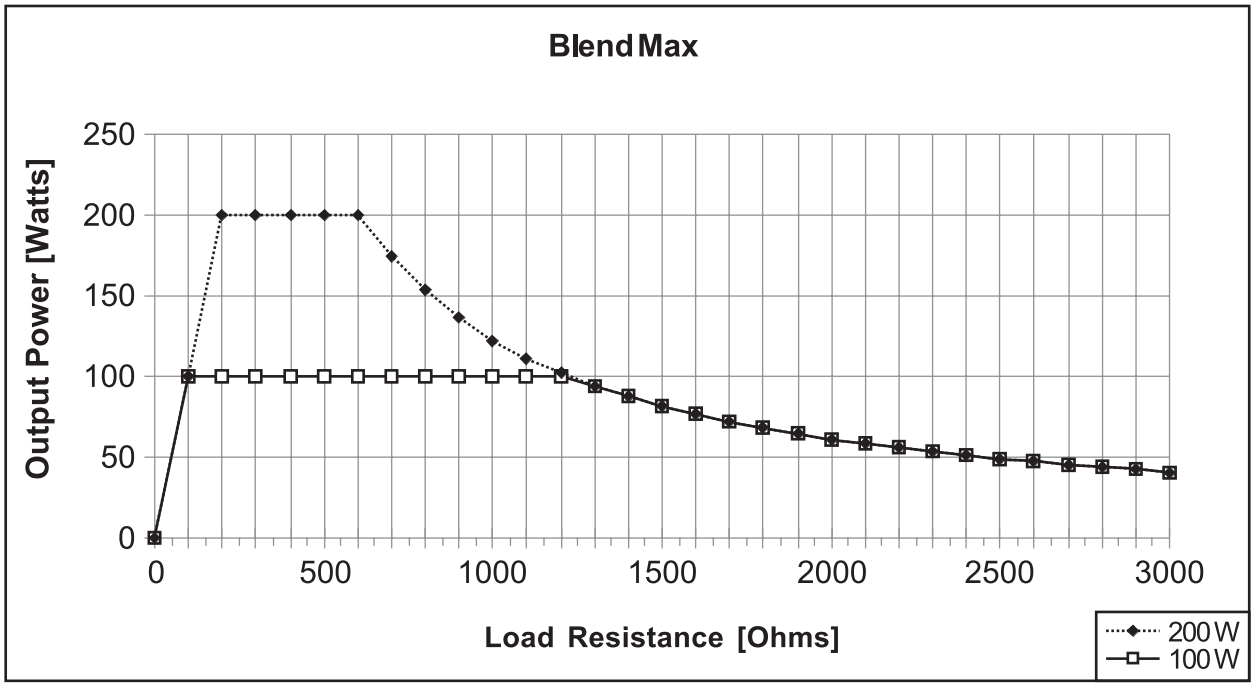


Figure 3 – 4 Output power vs impedance for Coagulation mode

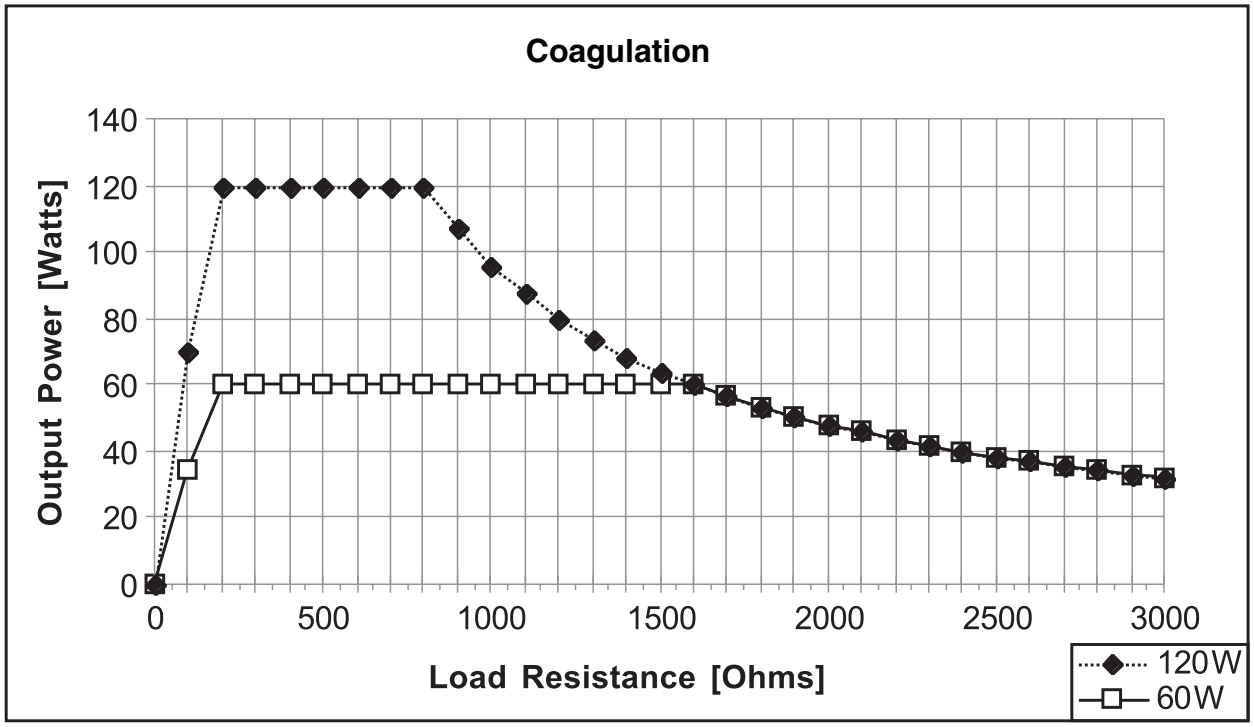


Figure 3 – 5 Output power vs impedance for Fulguration mode

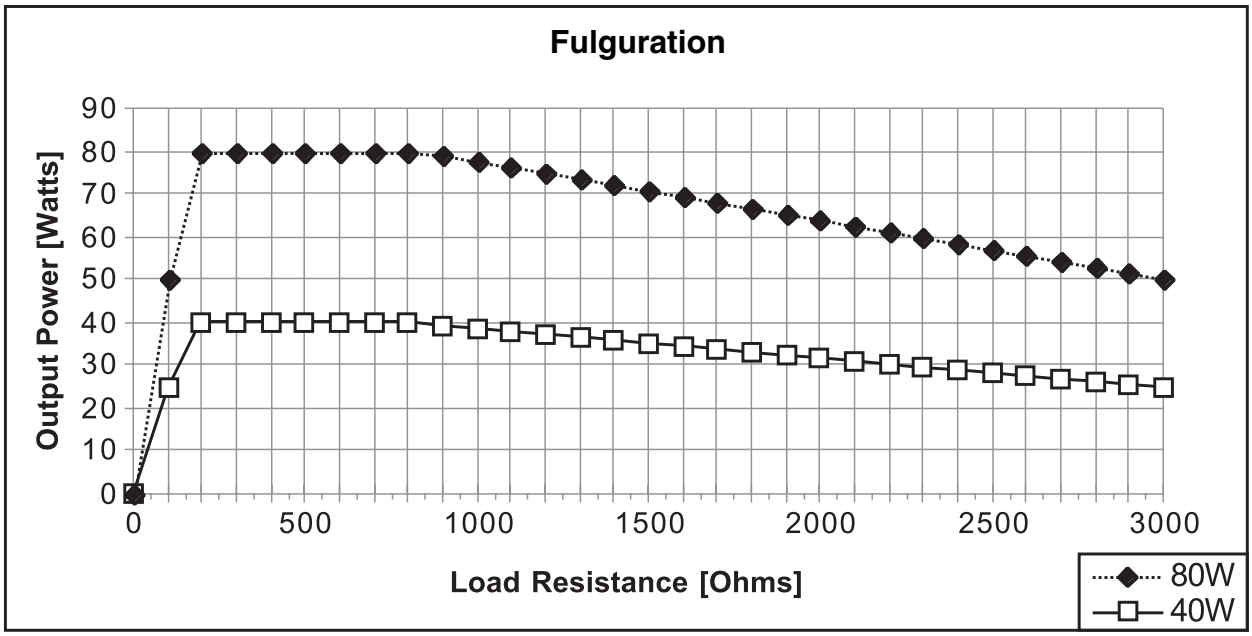
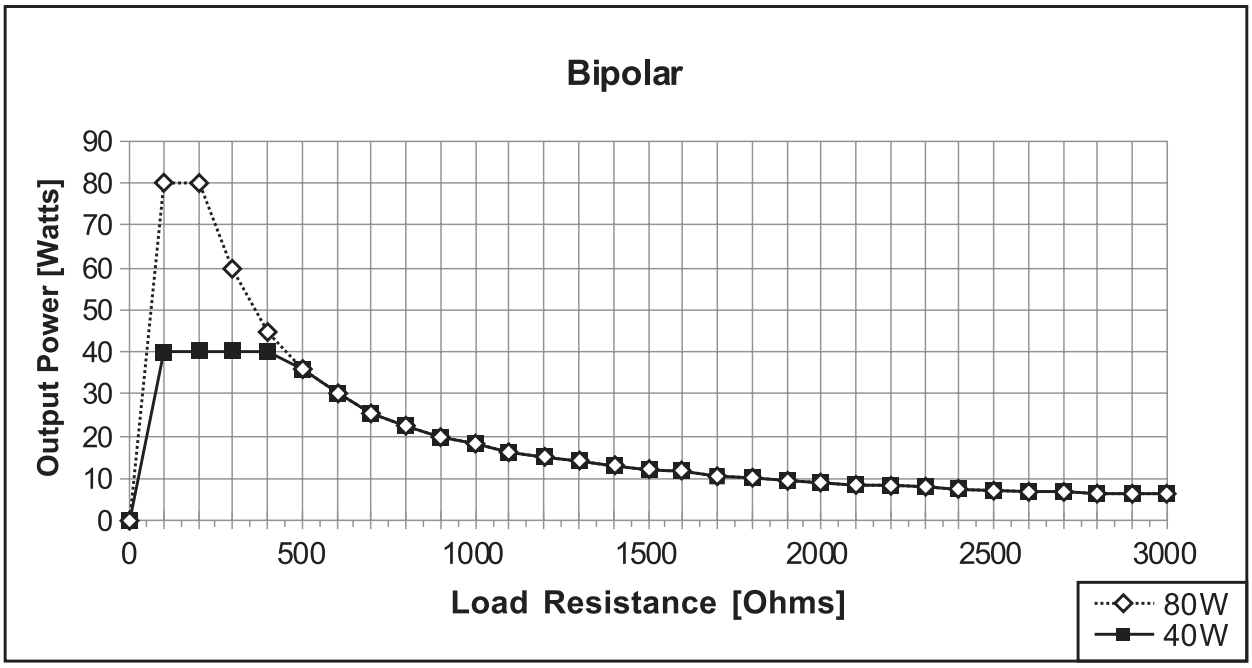


Figure 3 – 6 Output power vs impedance for Bipolar mode



Output Waveforms

The following figures are the output waveforms as viewed on an oscilloscope.

Figure 3 – 7 Cut set to 200 W, at no load, open

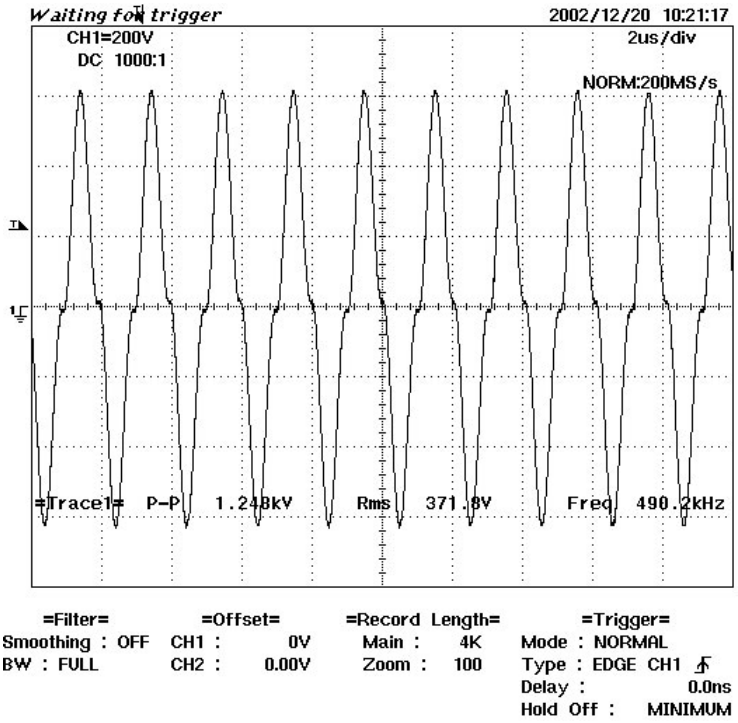


Figure 3 – 8 Cut set to 200 W, actual power 200 W at 300 ohm load

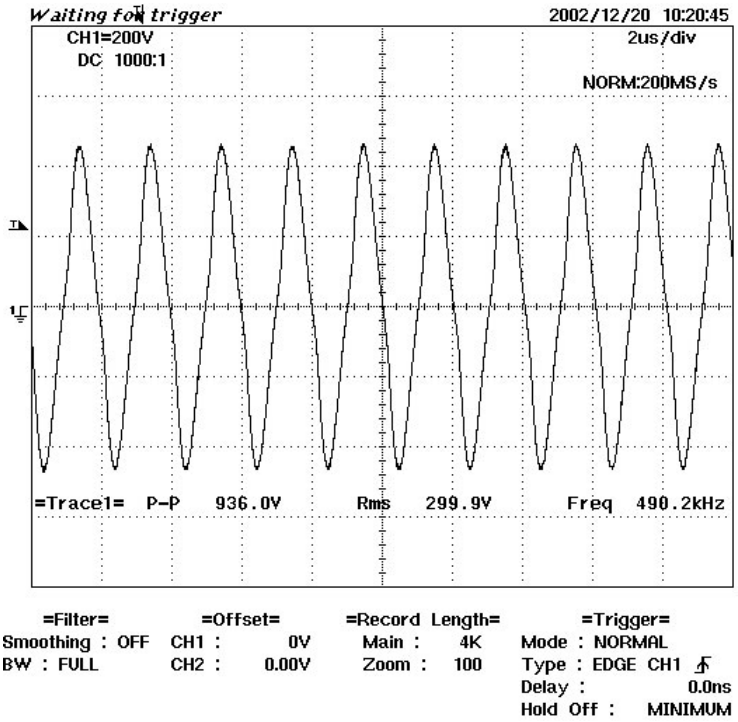


Figure 3 – 9 Blend minimum set to 200 W, at no load, open

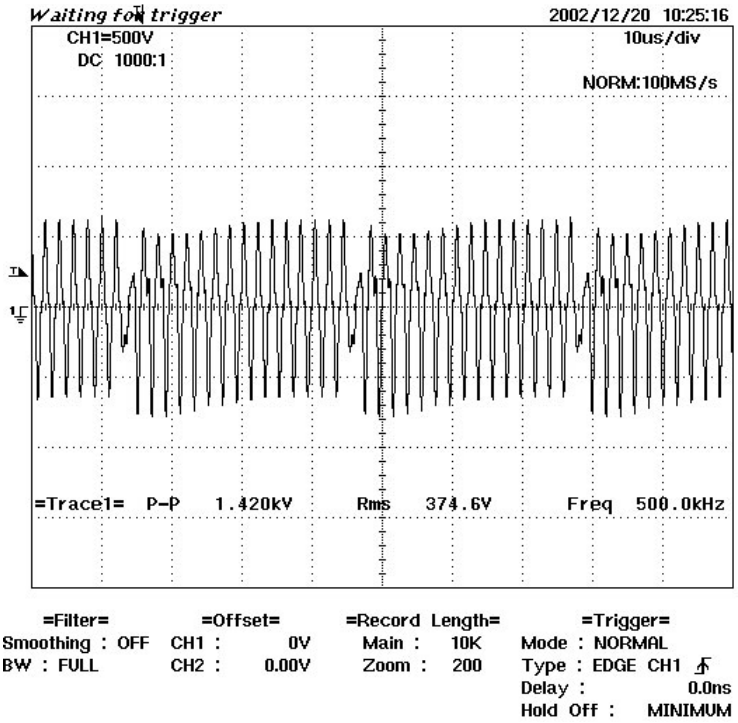


Figure 3 – 10 Blend minimum set to 200 W, actual power 200 W at 300 ohm load

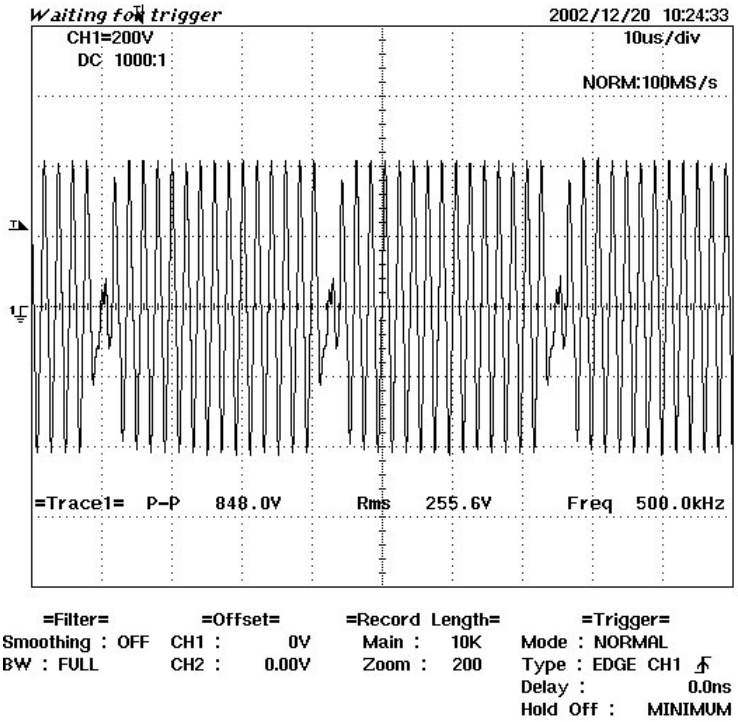


Figure 3 – 11 Blend maximum set to 200 W, at no load, open

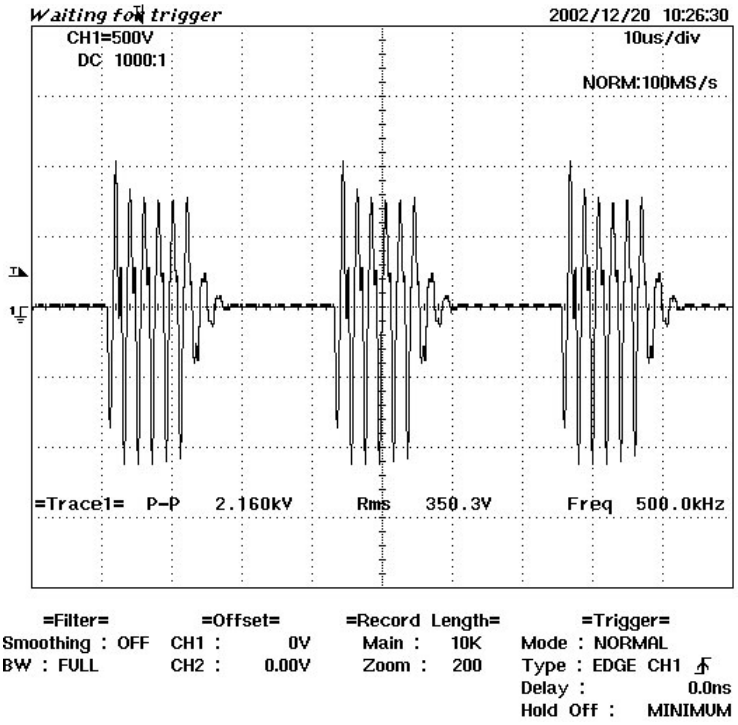


Figure 3 – 12 Blend maximum set to 200 W, actual power 200 W at 300 ohm load

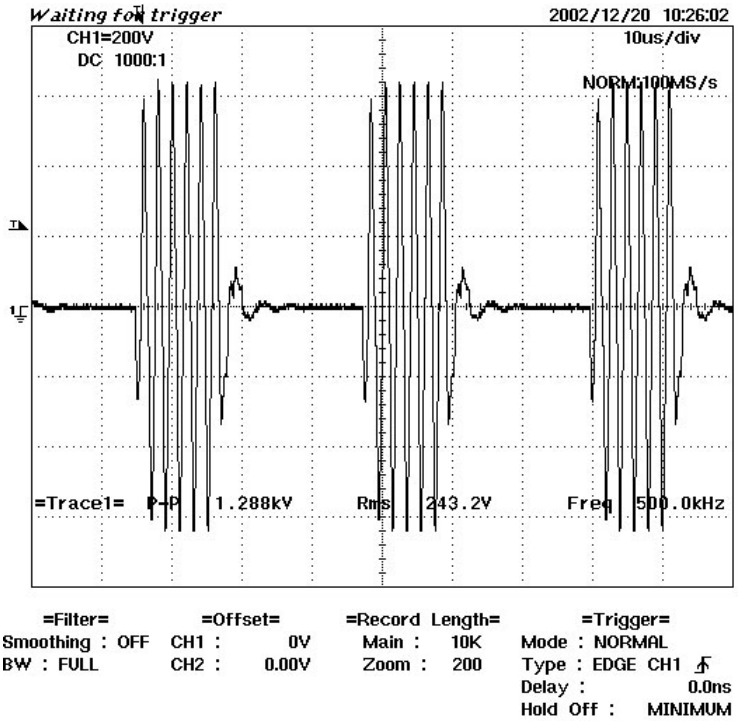


Figure 3 – 13 Coagulation set to 120 W, at no load, open

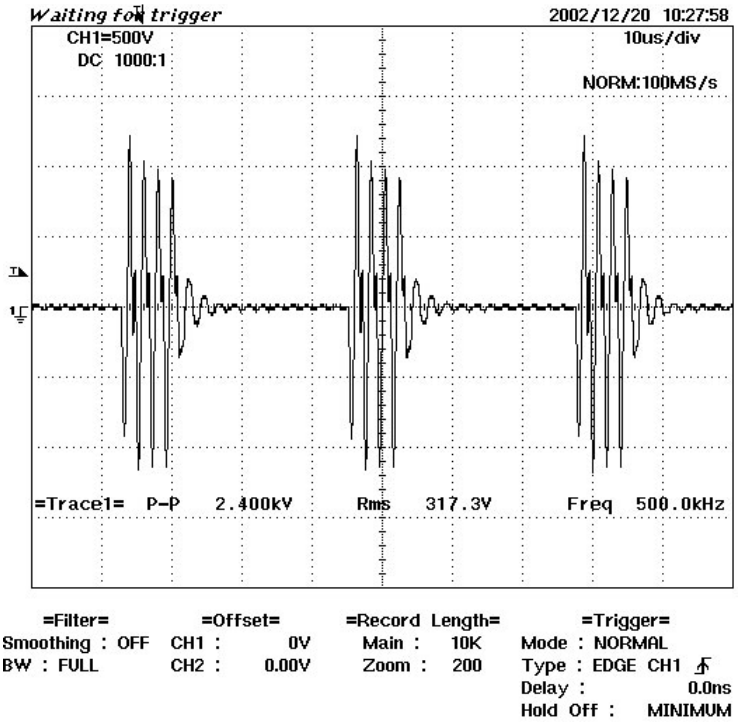


Figure 3 – 14 Coagulation set to 120 W, actual power 120 W at 500 ohm load

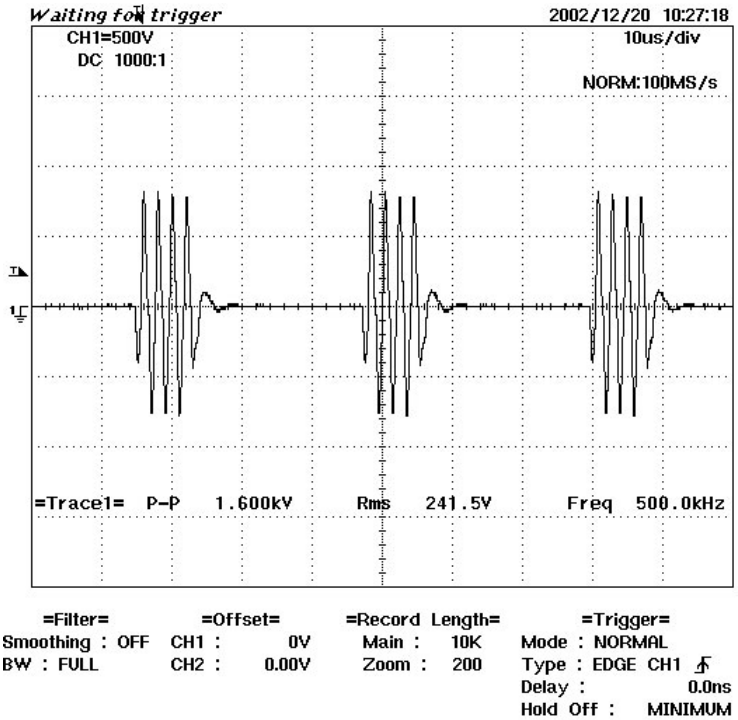


Figure 3 – 15 Fulguration set to 80 W, at no load, open

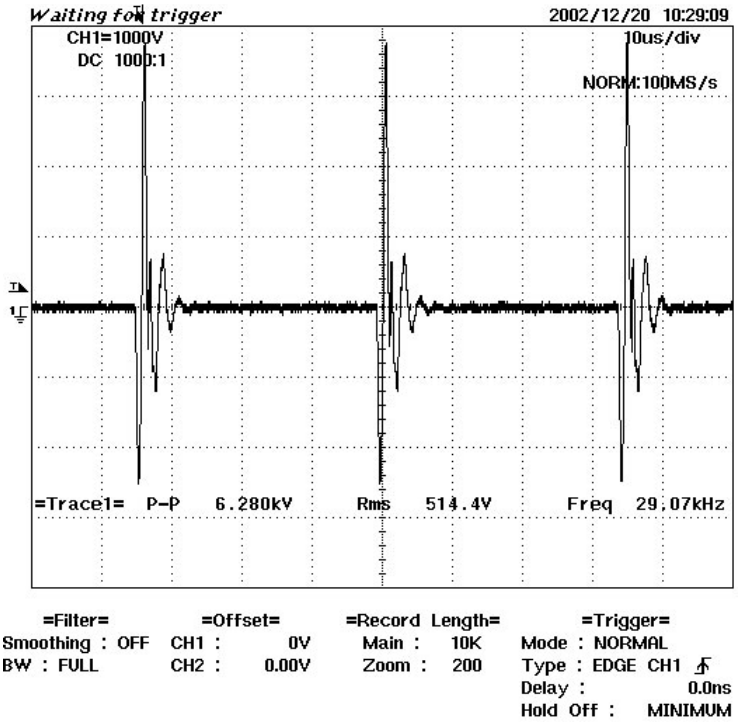


Figure 3 – 16 Fulguration set to 80 W, actual power 80 W at 500 ohm load

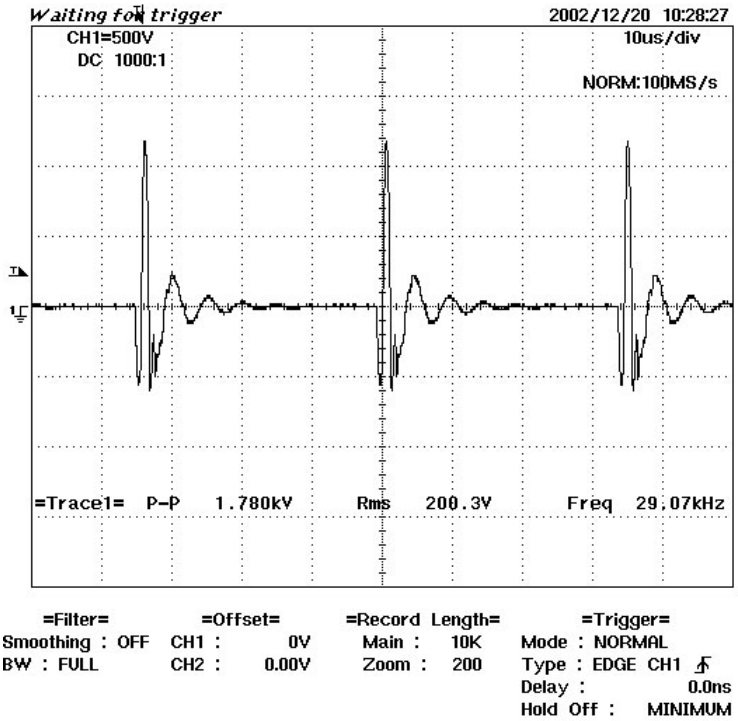


Figure 3 – 17 Bipolar set to 80 W, at no load

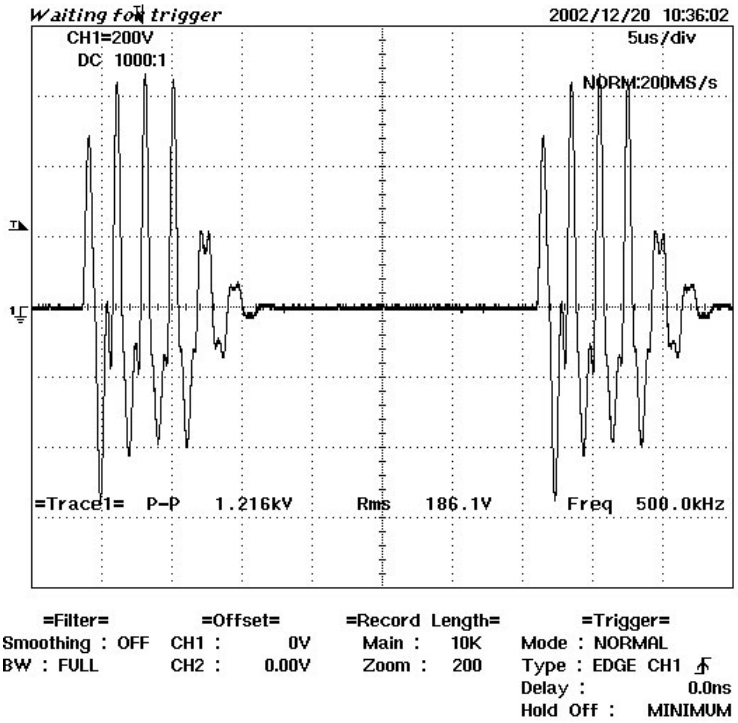
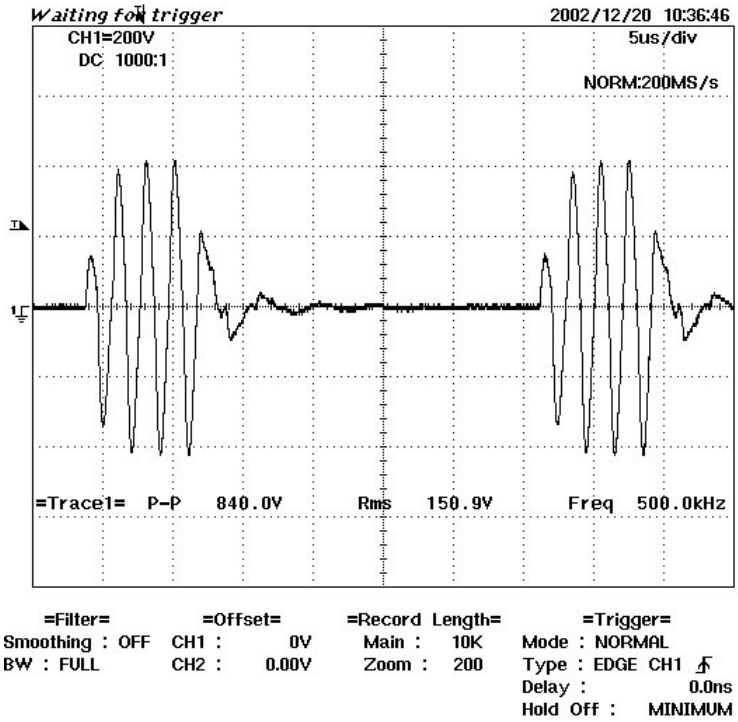
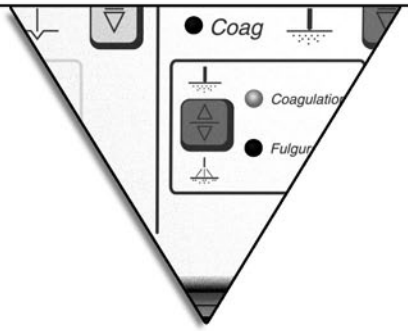


Figure 3 – 18 Bipolar set to 80 W, actual power set to 200 W load





SECTION 4

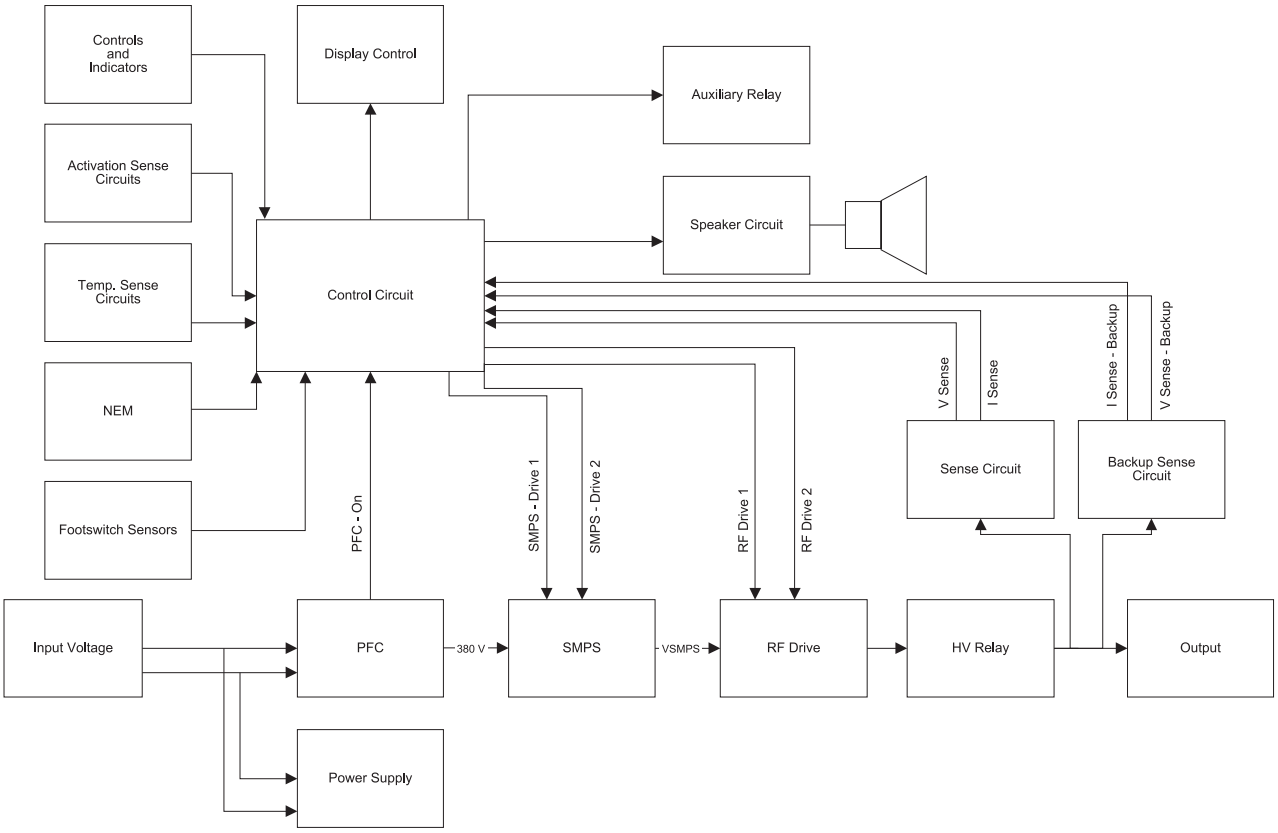
THEORY OF OPERATION

This section contains the following information

- *Block Diagram*
- *Functional Overview of Key Circuits*
- *Controls and Indicators*
- *Aaron 2250 Control Signal Inputs and Outputs*

BLOCK DIAGRAM

Figure 4 – 1 Functional Block Diagram of the Aaron 2250 system.



FUNCTIONAL OVERVIEW OF KEY CIRCUITS

The following descriptions highlight the main circuits in the Aaron 2250.

Controls and Indicators

The front panel overlay contains 10 membrane function switches. Each membrane switch is used to toggle between modes, presets, and power settings. The overlay interfaces with the display PCB to control user requests.

Activation Sense Circuits (5)

The Activation (Request) Sensing Circuits are used by the control circuit to detect both hand controlled activation and foot controlled activation requests. These circuits are made up of a Colpitts Oscillator (operating at approximately 50kHz) and a level detection circuit.

In a non-activation status, the Colpitts Oscillator operates at its set operating frequency, and presents a sine wave to the level detection circuit. The level detection circuit converts the sine wave into a square wave. Activation will not occur as long as a square wave is present.

When a resistance (approx. 200 Ω or less) is presented to the transformer's secondary winding by a hand-control or foot-control, the sense transformer is essentially shorted. The "short" is felt on the transformer's primary winding causing the Colpitts Oscillator to temporarily shut down.

When the oscillator shuts down, the sense signal becomes +5 VDC (logic "1"). This informs the system that a handswitch or footswitch activation has been made.

If the square wave (from any of the request sense circuits) is not present at the system logic when the unit is initially turned on, the system displays an error code, sounds an alarm, and disables RF output.

Temperature Sensing Circuits (3)

The Temperature Sensing Circuits are used by the control circuit to monitor the internal temperature of the unit. These sensors are used as thermal protection for the unit. If the internal temperature of the unit is too high an error code is displayed.

Neutral Electrode Monitoring Circuit (NEM)

The Bovie NEM™ is a quality monitoring circuit that detects the type of return electrode (solid or split). The circuit also continually monitors the contact quality between the patient and the split return electrode. This helps to eliminate patient burns at the return electrode site.

When you connect a single return electrode to the unit, the NEM will detect if the resistance is below 5 Ω. If it is, the 2250 will display the green single plate LED on the front of the unit.

When you connect a split return electrode to a patient, and the NEM detects a resistance between 10 and 135 Ω, then the 2250 will display the green split plate LED on the front of the unit.

The NEM constantly monitors the patient contact quality. If the impedance changes by a specific amount, then the unit will display an alarm, and immediately de-activate the RF output power.

Footswitch Sensor Circuits (2)

The Footswitch Sensor Circuits are used to determine the presence or absence of the monopolar and bipolar footswitch. The footswitch sensors circuits are made up of a Colpitts Oscillator (operating at approximately 50 kHz) and a level detection circuit.

In a non-activation status, the Colpitts Oscillator operates at its set operating frequency, and presents a sine wave to the level detection circuit. The level detection circuit converts the sine wave into a square wave. Activation will not occur as long as a square wave is present.

When a resistance (approximately 200 W or less) is presented to the transformer's secondary winding by a hand-control or foot-control, the sense transformer is essentially shorted. The "short" is felt on the transformer's primary winding causing the Colpitts Oscillator to temporarily shut down.

When the oscillator shuts down, the sense signal becomes +5 VDC (logic "1"). This informs the system logic that a handswitch or footswitch activation request has been made.

If the square wave (from any of the request sense circuits) is not present at the system logic when the unit is initially turned on, an error code is displayed, an alarm sounds, and the RF output is disabled.

Input Voltage

The Aaron 2250 is designed to operate at a wide range of input voltages. The unit will perform with in specifications with an input voltage within the range of 100-240VAC 50/60 Hz. The input voltage is connected via a power entry module. The power entry module is a medical grade filter to minimize leakage currents, radiated emissions, and conducted emissions.

Display Control Circuits

The Display Control Circuits are used to control all of the segment displays and LEDs used on the front panel.

Control Circuit

The control logic uses a Field Programmable Gate Array as the "brain" of the 2250. This system interprets all of the inputs and delivers the correct corresponding outputs.

Every operation of the unit is controlled from this system.

A System Clock Circuit, composed of an oscillator, provides the basic operating frequency of 10 MHz.

The Reset Circuit provides a single pulse at the time the 2250 is turned on. This pulse resets Field Programmable Gate Array to ensure proper operation.

Power Factor Correction Circuit (PFC)

The Power Factor Correction Circuit ensures lower power consumption. The circuit is used to correct the power load that is distributed to the unit's capacitors, providing the lowest voltage required for proper operation of the unit. The PFC also regulates the universal input of 100 to 240 watt voltages that power the unit.

Power Supply

The Aaron 2250 incorporates a medically approved 40W Quad output power supply. +12VDC, 5VDC, -12VDC, 3.3VDC, and 5VDC are generated by this power supply. These voltages are used by the main and display board to supply power to all logic circuits.

Switch Mode Power Supply Circuit (SMPS)

This circuit generates the high current voltage necessary to deliver the output power.

Auxiliary Relay

The Auxiliary Relay Circuit is used to control the relay connection on the rear of the unit. During activation of any mode, a signal is sent to this circuit to close the contact of a relay. The relay remains closed for a period of 3 seconds after an activation request has been terminated. The circuit is made up of a relay driver and a relay.

Speaker Circuit

The audio circuit is used by the system logic to generate activation tones and alarm tones. Volume for the activation tones may be adjusted from the back panel of the unit.

> ***NOTICE:***
> *Alarm volume cannot be adjusted up or down.*

RF Drive

The RF Drive Circuit is adjusted by the control logic to regulate the desired output power and waveforms.

HV Relay

The High Voltage (HV) Relay Circuits are used by the control logic to switch the power to the proper outputs, redirecting the RF power to the appropriate source of activation accessed by an auxiliary accessory on the unit

Output

The Output Circuit controls the unit's stage of operation that produces high voltage, high frequency generated power.

Sense and Backup Sense Circuits

This circuit combines both the Sense and Backup circuits into one signal that controls the unit's output power.

Voltage and current are sensed during power output.

CONTROLS AND INDICATORS

The Aaron 2250 controls and indicators are listed below:

- MEMBRANE SWITCHES Toggle between modes.
- DISPLAYS Three separate displays (Cut, Coag, & Bipolar) indicate the output power in watts.
- MODE INDICATORS Green LEDs indicate the present mode of the unit.
- POWER CONTROL SWITCHES These membrane switches adjust the output power for each mode.
- POWER SWITCH A double pole single throw switch that snaps into the front bezel. This switch supplies the AC mains current to the generator.

AARON 2250 CONTROL SIGNAL INPUTS AND OUTPUTS

CUT/COAG	This is an output signal that defines the modulation signal to the output stage.
RF_DRV1	This is an output signal from the system logic that generates the driving signal for the output stage.
RF_DRV2	This is an output signal from the system logic that generates the driving signal for the output stage.
DAMP	This is an output signal from the system logic to control the damping of the output.

The following table lists the important input and output signals. From a troubleshooting standpoint, the absence (and presence) of these signals will assist in isolating problems.

RQEST_SENSE_FOOT_ BIPOLAR	This is an input signal from the bipolar footswitch sense circuit. This signal is generated by a colpitts oscillator located on the display board and an isolation transformer located on the main board. When an activation request is made, the output for this circuit becomes a logic 1 (3.3 volts) signal.
RQEST_SENSE_FOOT_COAG	This is an input signal from the coag monopolar footswitch sense circuit. This signal is generated by a colpitts oscillator located on the display board and an isolation transformer located on the main board. When an activation request is made via the coag pedal on the monopolar footswitch, the output for this circuit becomes a logic 1 (3.3 volts) signal.
RQEST_SENSE_FOOT_CUT	This is an input signal from the cut monopolar footswitch sense circuit. This signal is generated by a colpitts oscillator located on the display board and an isolation transformer located on the main board. When an activation request is made via the cut pedal on the monopolar footswitch, the output for this circuit becomes a logic 1 (3.3 volts) signal.
RQEST_SENSE_HAND_COAG	This is an input signal from the coag monopolar hand sense circuit. This signal is generated by a colpitts oscillator located on the display board and an isolation transformer located on the main board. When an activation request is made via the coag button on the monopolar handpiece, the output for this circuit becomes a logic 1 (3.3 volts) signal.
RQEST_SENSE_HAND_CUT	This is an input signal from the cut monopolar hand sense circuit. This signal is generated by a colpitts oscillator located on the display board and an isolation transformer located on the main board. When an activation request is made via the cut button on the monopolar handpiece, the output for this circuit becomes a logic 1 (3.3 volts) signal.
FOOT_BIPOLAR _CONTACT	This is an input signal from the bipolar foot contact sense circuit. This signal is generated by a colpitts oscillator located on the display board and an isolation transformer located on the main board. When a bipolar footswitch is connected to the rear of the unit, the output for this circuit becomes a logic 1 (3.3 volts) signal.
FOOT_MONO_CONTACT	This is an input signal from the monopolar foot contact sense circuit. This signal is generated by a colpitts oscillator located on the display board and an isolation transformer located on the main board. When a monopolar footswitch is connected to the rear of the unit, the output for this circuit becomes a logic 1 (3.3 volts) signal.
NEM_DAT0 – NEM_DATA7	Data lines between the system logic and the NEM circuit. Used to monitor the temperature of the NEM circuit and the return electrode contact impedance.
NEM_A_D_INTR	This is a communication signal from the system logic to the NEM circuit.
NEM_A_D_OFL	This is a communication signal from the system logic to the NEM circuit.
NEM_A_D_CS	This is a communication signal from the system logic to the NEM circuit.
NEM_A_D_READ	This is a communication signal from the system logic to the NEM circuit.
NEM_A_D_WRITE	This is a communication signal from the system logic to the NEM circuit.
NEM_A_D_MODE	This is a communication signal from the system logic to the NEM circuit.

SMPS_DRV2	This is an output signal from the system logic to control the SMPS circuit. Used for controlling the voltage of the high voltage power supply, controls the output power.
SMPS_DRV1	This is an output signal from the system logic to control the SMPS circuit. Used for controlling the voltage of the high voltage power supply, controls the output power.
ON/RST_CS	This is an output signal from the system logic to control the SMPS circuit to reset the SMPS current overload protection circuit.
CS_ON	This is an input signal from the SMPS circuit to the system logic used for error detection for current overload sensing.
CALIBRATE MODE	This is an input signal to the system logic that places the unit into calibration mode.
CAL_1 – CAL_8	These are output signals from the system logic to an external fixture for calibration of the NEM circuit.
PC_DOUT	Reserved.
PC_CLK	Reserved.
PC_SYNC	Reserved.
PC_DIN	Reserved.
IV_SENS_CAL_ENTER	This is an input signal to the system logic to initialize the automatic calibration procedure for the current and voltage sensors.
ENTER	This is an input signal to the system logic to initialize the NEM calibration routine.
DISP_BIP_SEL_0 – DISP_BIP_SEL_2	These are output signals from the system logic to control the bipolar display.
DISP_COAG_SEL_0 – DISP_COAG_SEL_2	These are output signals from the system logic to control the coag display.
DISP_CUT_SEL_0 – DISP_CUT_SEL_2	These are output signals from the system logic to control the cut display.
DIN0-DIN7	This is a seven-segment display input date.
BLEND_UP	This is an input signal to the system logic from the front panel overlay to increment the blend setting.
BLEND_DOWN	This is an input signal to the system logic from the front panel overlay to decrement the blend setting.
CUT_DOWN	This is an input signal to the system logic from the front panel overlay to decrease the power setting for Cut I, Cut II and Blend modes.
CUT_UP	This is an input signal to the system logic from the front panel overlay to increase the desired power setting for Cut I, Cut II and Blend modes.
PIN/SPRAY	This is an input signal to the system logic from the front panel overlay to toggle between the Coagulation and Fulguration coag setting.
CUT/BLEND	This is an input signal to the system logic from the front panel overlay to toggle between the Cut I, Cut II and Blend modes.

NEM_CLK_GEN	This is and output signal from the system logic that generates a 62.5 kHz square wave. This signal is used by the NEM circuit.
NEM_PAD_SENSE_EN	This is an output signal from the system logic that controls an analog switched. This signal is used by the NEM circuit to change the analog signal sent to the NEM A/D.
NEM_TEMP_SENSE_EN	This is an output signal from the system logic that controls an analog switched. This signal is used by the NEM circuit to change the analog signal sent to the NEM A/D.
SENS_RANGE	Reserved
AUD_DRV	This is an output signal from the system logic that generates the activation tones for all modes of operation. A 1kHz square wave is generated whenever Cut I, Cut II or Blend modes are activated. A 2Khz square wave is generated when the Coagulation, Fulguration or Bipolar modes are activated. This signal is used by the audio circuit.
ALARM_DRV	This is and output signal from the system logic that generates a 2 kHz / 1kHz square wave for activating the alarm siren. This signal is used by the audio circuit.
AUX_RLY	This is an output signal from the system logic that controls the accessory relay on the back panel.
FULG_EN	This is an output signal from the system logic that controls the relays to allow fulguration coagulation output.
MONO_EN	This is an output signal from the system logic that controls the relays to allow output to be present at the monopolar foot controlled receptacle.
HANDLE_EN	This is an output signal from the system logic that controls the relays to allow output to be present at the monopolar handpiece receptacle.
BIPOLAR_EN	This is an output signal from the system logic that controls the relays to allow output to be present at the bipolar receptacle.
FOOTC_EN	This is an output signal from the system logic that controls the relays to allow output to be present at the foot control receptacle.
RETPAD_EN	This is an output signal from the system logic that controls the relays to allow output to be present at the monopolar return receptacle.
PFC_ON	This is an output signal from the system logic that turns on the power factor correction circuit during activation of the unit.

COAG_DOWN	This is an input signal to the system logic from the front panel overlay to decrease the power setting for Coagulation and Fulguration coag modes.
COAG_UP	This is an input signal to the system logic from the front panel overlay to increase the power setting for Coagulation and Fulguration coag modes.
BIPOLAR_DOWN	This is an input signal to the system logic from the front overlay to decrease the power setting for the Bipolar mode.
BIPOLAR_UP	This is an input signal to the system logic from the front overlay to decrease the power setting for the Bipolar mode.
LED_SEL0	This is an output signal from the system logic to the display circuit for controlling the LED's on the front panel.
LED_SEL_1	This is an output signal from the system logic to the display circuit for controlling the LED's on the front panel.
BLEND_LED_SEL_0	This is an output signal from the system logic to the display circuit for controlling the LED's on the Blend bar.
BLEND_LED_SEL_1	This is an output signal from the system logic to the display circuit for controlling the LED's on the Blend bar.
A/D_0 – A/D_7	These are data lines between the system logic and the A/D for sensing voltage levels, impedance and current.
A/D_CLK	This is an output clock signal from the system logic to the A/D.
A/D_SELECT	This is an output signal from the system logic to control the channel that is being converted from analog to digital information.
CS_A/D_IV	This is a communication line used by the system logic to control the sensing A/D's.
CS_A/D_L	This is a communication line used by the system logic to control the sensing A/D's.
CS_A/D_BACKUP	This is a communication line used by the system logic to control the sensing A/D's
A/D_SLEEP	This is a communication line used by the system logic to control the sensing A/D's.
TEST_MUX_0 – TEST_MUX_2	This is a communication line used by the system logic to control the sensing A/D's.

A/D1_REF_V_DAC_DATA	This is a communication line used by the system logic to control the sensing A/D's.
A/D1_REF_V_DAC_SCLK	This is a communication line used by the system logic to control the sensing A/D's.
A/D1_REF_V_DAC_SYNC	This is a communication line used by the system logic to control the sensing A/D's.
A/D2_REF_V_DAC_DATA	This is a communication line used by the system logic to control the sensing A/D's.
A/D2_REF_V_DAC_SCLK	This is a communication line used by the system logic to control the sensing A/D's.
A/D2_REF_V_DAC_SYNC	This is a communication line used by the system logic to control the sensing A/D's.
BURN_TST	This is an input signal to the control logic for toggling the unit into automatic burn-in routine.
AUX1_JMP	Reserved
TEST_JMP	Reserved
I_TRANS_1	This is an input signal from the current sensor to the control logic. Used to monitor the output current of the unit.
I_TRANS_2	This is an input signal from the current sensor to the control logic. Used to monitor the output current of the unit.
I_TRANS_3	This is an input signal from the current sensor to the control logic. Used to monitor the output current of the unit.
V_TRANS_1	This is an input signal from the voltage sensor to the control logic. Used to monitor the output voltage of the unit.
V_TRANS_2	This is an input signal from the voltage sensor to the control logic. Used to monitor the output voltage of the unit.
V_TRANS_3	This is an input signal from the voltage sensor to the control logic. Used to monitor the output voltage of the unit.
L_TRANS_1	This is an input signal from the impedance sensor to the control logic. Used to monitor the output voltage of the unit.
L_TRANS_2	This is an input signal from the impedance sensor to the control logic. Used to monitor the output voltage of the unit.
L_TRANS_3	This is an input signal from the impedance sensor to the control logic. Used to monitor the output voltage of the unit.
TEMP_1	This is an input signal from the temperature circuit to the control logic. Used to monitor internal temperature of the unit.
TEMP_2	This is an input signal from the temperature circuit to the control logic. Used to monitor internal temperature of the unit.
TEMP_3	This is an input signal from the temperature circuit to the control logic. Used to monitor internal temperature of the unit.
VB_TRANS_1	This is an input signal from the backup voltage sensor to the control logic. Used to monitor the output voltage of the unit.
VB_TRANS_2	This is an input signal from the backup voltage sensor to the control logic. Used to monitor the output voltage of the unit.
VB_TRANS_3	This is an input signal from the backup voltage sensor to the control logic. Used to monitor the output voltage of the unit.
IB_TRANS_1	This is an input signal from the backup current sensor to the control logic. Used to monitor the output current of the unit.
IB_TRANS_2	This is an input signal from the backup current sensor to the control logic Used to monitor the output current of the unit.
IB_TRANS_3	This is an input signal from the backup current sensor to the control logic. Used to monitor the output current of the unit.

SECTION 5

OPERATING THE AARON 2250

This section covers the following topics:

- *Inspecting the Generator and Accessories*
- *Service Personnel Safety*
- *Installation and Placement*
- *Functional (operational) Checks*
- *Operating the Unit*
- *Activating the Unit*

INSPECTING THE GENERATOR AND ACCESSORIES

Before each use of the Aaron 2250, inspect the unit and all accessories to verify good working order:

- Inspect for physical damage to the generator and its connections.
- Verify that the appropriate accessories and adapters are present.
- Inspect all cords and connectors for signs of wear, damage, and abrasion.
- Verify that no error messages are displayed when the unit is turned on.

SERVICE PERSONNEL SAFETY

WARNINGS:

Hazardous Electrical Output This equipment is for operational use only by a trained, licensed, physician. Bio-Med Technicians must also exercise caution when testing or repairing a unit.

Electric Shock Hazard Connect the generator power cord to a properly grounded receptacle. Do not use power plug adapters.

Connect the power cord to a properly polarized and grounded power source with the frequency and voltage characteristics that match those listed on the back of the unit.

Fire Hazard Do not use extension cords.

CAUTIONS:

Do not stack equipment on top of the generator or place the generator on top of electrical equipment. These configurations are unstable and / or do not allow for adequate cooling.

Provide as much distance as possible between the electrosurgical generator and other electronic equipment (such as monitors). An activated electrosurgical generator may cause interference with them.

Nonfunction of the generator may cause interruption of surgery. A backup electrosurgical generator should be available for use.

Do not turn the activation tone down to an inaudible level. This activation tone alerts the surgical team when an accessory (and the generator) is active.

When using a smoke evacuator in conjunction with the electrosurgical generator, place the smoke evacuator a distance away from the generator. Set the generator's volume control (on the rear panel) at a level that ensures all activation tones may be heard.

NOTICES:

Be familiar with the Cautions and Warnings described in this guide.

If required by local codes, connect the generator to the hospital equalization connector with an equipotential cable. There is a equipotential connector on the rear of the unit.

Connect the power cord to a wall outlet having the correct voltage. Otherwise product damage may result.

If the following functional operational checks do not present the desired verification, refer to Section 7, Troubleshooting *or* Section 8, Repair Policy and Procedures.

CAUTION:

Some of the following functional checks and procedures are for reference only and should not be self applied to the service technician or physician.

INSTALLATION AND PLACEMENT

Place the 2250 on any flat surface with a tilt angle of not more than 10 degrees. The unit relies on natural convection cooling. Do not block the rear vents.

Ensure that air flows freely on all sides of the unit.

WARNING:

Connect the power cord to a properly polarized and grounded power source with the frequency and voltage characteristics that match those listed on the back of the unit.

FUNCTIONAL (OPERATIONAL) CHECKS

Upon initial installation of the unit, perform the following operational checks. Refer to the figures in *Controls, Indicators, and Receptacles* for the location of connectors and generator controls.

WARNING:

At no time should you touch the active electrode or bipolar forceps.

Operating the Unit

1. Verify that the generator is Off by pressing the power switch Off (O).
2. Place the generator on a stable flat surface, such as a table, platform, or medical cart. Carts with conductive wheels are recommended. For details, refer to the procedures for your institution or to local codes. Provide at least 10 to 15 cm (4 to 6 in.) of space from the sides and top of the generator for cooling. Normally, the top, sides, and rear panel are warm when you use the generator continuously for extended periods of time.
3. Plug the generator power cord into the AC Power Cable Receptacle on the rear panel.
4. Plug the generator power cord into a grounded receptacle.
5. Turn on the generator by pressing the power switch On (|). Verify the following:
   - All visual indicators and displays on the front panel illuminate.
   - Activation tones sound to verify that the speaker is working properly.
6. If the self-test is successful, a tone sounds. Verify the following:
   - A Cut mode is selected; a Coag mode is selected.
   - Each display shows a power setting. The unit automatically powers up to the last used modes and settings.
   - The Patient Return Electrode Alarm Indicator illuminates red.

If the self-test is not successful, an alarm tone sounds. An error code may appear in the Cut display and/or the Coag display, in most cases, the generator is disabled. Note the error code and refer to *Section 7, Troubleshooting*.

Once the self-test is successful, connect the accessories and set the generator controls. Refer to *Preparing for Monopolar Surgery* or *Preparing for Bipolar Surgery* later in this section.

Preparing for Monopolar Surgery

Monopolar surgery requires a return electrode.

Applying the Return Electrode

To maximize patient safety, Aaron Medical recommends using a split return electrode and a Aaron generator with a contact quality monitoring system (Bovie NEM™).

> ***NOTICE:***
> *The Bovie NEM™ system recommends that you use a split return electrode.*

Refer to the manufacturer's instructions for application site and placement procedures. When using metal plate return electrodes, use a conductive gel specifically designed for electrosurgery. Select a return electrode site with good blood flow. While a properly applied electrode results in minimal tissue heating beneath the electrode, a good blood flow helps carry heat away from the site.

1. Connect the cable to the Return Electrode receptacle on the front of the unit.
   The unit will automatically sense the presence of a split or solid return electrode and, if a split return electrode is used, will constantly monitor the resistance at the contact between the electrode and the patient.
2. Adjust the Blend setting to the desired amount of hemostasis (Level 1-10). Adjustment is preformed by pressing the up or down buttons next to the Blend setting indicator. Verify that the Blend indicator bar displays the desired setting and the LED above Blend on the front panel is illuminated.
3. Select the desired power settings for Cut. Adjustment is preformed by pressing the up or down buttons next to the Cut display. This selection should advance the power display numbers in 1 to 5 watt increments. Verify that the Cut mode can be adjusted to the desired settings.
4. Select the mode of operation for Coagulation, either Coagulation or Fulguration. Adjustment is preformed by pressing the up or down buttons next to the Pinpoint and Spray mode indicator. Verify that the desired mode can be selected and the correct LED illuminates.
5. Select the desired power setting for Coagulation. Adjustment is preformed by pressing the up or down buttons next to the Coag display. This selection should advance the power display numbers in 1 to 5 watt increments. Verify that the power can be adjusted to the desired output.

Connecting Accessories

1. Connect a monopolar handpiece with electrode to the appropriate monopolar handpiece receptacle on the front of the unit.

If using a footswitch activated device, connect an appropriate Aaron footswitch to the monopolar footswitch connecting socket on the rear of the unit.

2. To activate the Monopolar mode, depress the cut or coag button on the monopolar handpiece or the cut or coag pedal on the monopolar footswitch.

Preparing for Bipolar Surgery

1. Connect a Bipolar cable to the Bipolar receptacle on the front of the unit.
2. Connect a forceps instrument to the bipolar cable.
3. Connect the bipolar footswitch to the bipolar footswitch connecting socket located on the rear of the unit.

To activate the Bipolar mode, depress the pedal on the bipolar footswitch.

ACTIVATING THE UNIT

***NOTICES**:*
When you turn on your unit remember the following features:

The Aaron 2250 will power up to the last used modes and last used settings.

During activation, the activated mode can be adjusted up and or down a maximum of four steps. Refer to the following table for power increments.

POWER SETTINGS	INCREMENTS	FOR INSTANCE...
1-50 Watts	1 Watts	While activated, the Cut power output of 30 watts can be adjusted 4 steps down to 26 watts or 4 steps up to 34 watts.
51-100 Watts	2 Watts	
101-200 Watts	5 Watts	

1. Monopolar Cut – select the mode of operation for Cut or Blend then select the desired Cut power settings by pressing the up and down buttons next to the Cut power output display.
2. If using Blend, vary the blend setting by pressing the up and down buttons next to the blend amount indicator graph.
3. Monopolar Coag – select the mode of operation for coagulation: Coagulation or Fulguration, then select the coagulation power settings by pressing the up and down buttons next to the Coag power output display.
4. Bipolar – adjust the Bipolar power settings by pressing the up and down buttons next to the Bipolar power output display.
5. Activate the generator by pressing the appropriate button on the handpiece or pedal on the footswitch.

NOTICE:
Monopolar and bipolar footswitching operations are controlled by independent foot controls.

SECTION 6

MAINTAINING THE AARON 2250

This section covers the following topics:

- *Cleaning*
- *Periodic Inspection*
- *Fuse Replacement*

Aaron Medical recommends that you complete periodic inspection and performance testing. Perform inspections and performance testing every six months. A qualified biomedical technician should conduct this testing to ensure that the unit is operating effectively and safely.

CLEANING

After each use, clean the unit.

WARNING:
Electric Shock Hazard - Always turn off and unplug the generator before cleaning.

NOTICE:
Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.

1. Turn off the generator, and unplug the power cord from the wall outlet.
2. Thoroughly wipe all surfaces of the generator and power cord with a mild cleaning solution or disinfectant and a damp cloth. Follow the procedures approved by your institution or use a validated infection control procedure. Do not allow fluids to enter the chassis. Do not sterilize the generator.

PERIODIC INSPECTION

Every six months, visually inspect the Aaron 2250 for signs of wear or damage.
In particular, look for any of the following problems:

- Damage to the power cord
- Damage to the power cable receptacle
- Obvious damage to the unit
- Damage to any receptacle
- Accumulation of lint or debris in or around the unit

FUSE REPLACEMENT

Fuses for the unit reside directly below the Power Cable Receptacle on the rear of the unit.

To replace the fuses, follow this procedure:

1. Unplug the power cord from the wall outlet.
2. Remove the power cord from the Power Cable Receptacle on the rear panel.
3. To release the fuse drawer, insert a small flathead screwdriver into the slot on the drawer below the power cord receptacle. Then, slide the drawer out.
4. Remove the two fuses and replace them with new fuses with the same values.
5. Insert the fuse holder into the Power Cable Receptacle.

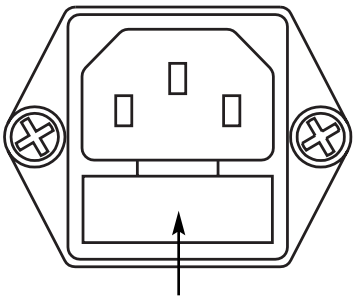


Figure 6 – 1 Fuse holder

FUSE REPLACEMENT ON THE MAIN PCB

Additional fuses for the unit reside on the Main PCB. Fuse values are indicated in the table below.
To replace the fuses, follow this procedure:

1. Unplug the power cord from the wall outlet.
2. Remove the power cord from the Power Cable Receptacle on the rear panel.
3. Remove the six screws that secure the cover panel to the unit.
4. Lift off the top cover panel.
5. Remove the two fuses using a fuse pulling tool.
6. Replace the fuses with the same values as listed below.
7. Replace and secure the cover panel.

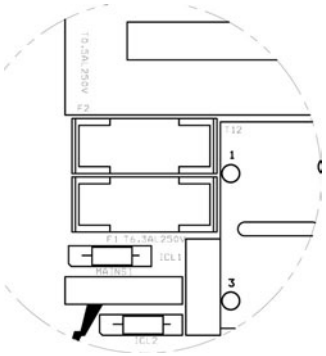


Figure 6 – 2 Fuse location

Main PCB Fuse Information

	FS1	FS2
VAC	250 VAC	250 VAC
AMPS	6.3 A	0.5 A
Size	5 x 20 mm	5 x 20 mm
Type	Slow Blow	Slow Blow

SECTION 7

TROUBLESHOOTING

This section includes error code descriptions and actions to take to resolve them.

RECOMMENDED EQUIPMENT FOR TROUBLESHOOTING

The following equipment enables you to troubleshoot and repair the Aaron 2250.

- Digital multimeter with leads
- Electrosurgical analyzer or a true RMS voltmeter such as a Fluke 8920A
- Wideband current transformer such as a Pearson 4100
- Non-inductive RF load resistors 200, 500, 800, 1000 ohms (150 watts)
- Oscilloscope (dual channel) at 100 MHz
- Oscilloscope probes, (2) 10X and 1000X
- Aaron footswitches (monopolar, bipolar)
- Monopolar instruments (handswitch and footswitch)
- Standard technician's tool kit
- Miscellaneous test leads and cables
- Bipolar handpiece and cable
- Return electrode cable

TROUBLESHOOTING THE AARON 2250

If the generator is not functioning properly, use the information in this section to perform the following activities:

- Identify and correct the malfunction.
- If an error code was displayed, take the appropriate action(s) to correct the error condition.

Inspecting the Generator

If the Aaron 2250 malfunctions, check for obvious conditions that may have caused the problem.

1. Check the generator for visible signs of physical damage.
2. Verify that all accessory cords are properly connected.
3. Check the power cord. Replace the power cord if you find exposed wires, cracks, frayed insulation, or a damaged connector.
4. Open the fuse drawer and inspect the fuse housing and fuses for damage and corrosion.
5. Verify that the fuses are firmly seated. An internal component malfunction in the generator can damage the fuses.
6. You may need to replace the fuses if the generator fails the self-test or stops functioning. Refer to *Fuse Replacement* in *Section 6*.

Inspecting the Receptacles

Equipment required:

- Aaron footswitches (monopolar, bipolar)
- Bipolar handpiece and cable
- Monopolar instruments (handswitch and footswitch)
- Return electrode cable

Procedure:

1. Turn off the generator.
2. Disconnect the power cord.
3. Check the footswitch receptacles on the rear of the unit for obvious signs of obstruction and damage.

4. Check for a secure fit by inserting the footswitch connectors into footswitch receptacles.
   If the footswitch receptacles are damaged, replace the footswitch connector assembly.
5. Check the bipolar receptacle on the front of the unit for obstruction or damage.
6. Insert a bipolar cable into the bipolar receptacle on the front of the unit. Verify a secure fit.
   If the bipolar receptacle is damaged, replace the bipolar connector assembly.
7. Check the monopolar handpiece receptacle on the front of the unit for obstruction or damage.
8. Insert a handswitching pencil into the monopolar handpiece receptacle on the front of the unit.
   Verify a secure fit.
   If the monopolar handpiece receptacle is damaged, replace the monopolar handpiece assembly.
9. Check the monopolar foot controlled receptacle on the front of the unit for obstruction or damage.
10. Insert a monopolar foot controlled handpiece into the monopolar foot control receptacle on the front of the unit.
    Verify a secure fit.
    If the monopolar foot controlled receptacle is damaged, replace the connector assembly.
11. Check the Return Electrode receptacle on the front of the unit for a broken pin or an obstruction.
12. Insert a return electrode cable into the return electrode receptacle. Verify a secure fit.
    If the return electrode receptacle on the front of the unit is damaged, replace the return electrode cable assembly.

Inspecting Internal Components

CAUTIONS:
The generator contains electrostatic-sensitive (ESS) components. When repairing the generator, work at a static-control workstation.

Wear a grounding strap when handling electrostatic-sensitive components.

Handle circuit boards by their nonconductive edges.

Use an anti-static container for transport of electrostatic-sensitive components and circuit boards.

To inspect the internal components, follow this procedure:

1. Remove the six screws that secure the cover to the chassis.
2. Lift the cover off the chassis. Save the cover and screws for later reinstallation.
3. Visually inspect and verify that all connectors are firmly seated.
4. Inspect each board for damaged components, wires, cracks and corrosion.
5. Reinstall the cover by positioning the cover over the chassis, and securing the four 6 - 32 x 5⁄16" screws to the bottom sides of the chassis and the two 6 - 32 x ½" screws to the lower front chassis.

UNDERSTANDING ERROR CODES AND AUDIO TONES

The Aaron 2250 includes automatic self-diagnostics. If the diagnostics detect an error, the system displays an error code, sounds an audible tone, and deactivates the output power.

Most error codes result from faults in accessories attached to the unit. The following table lists the error codes, describes the errors, and recommends actions to take to resolve the errors.

All error codes are displayed in the Bipolar display.

Error Code	Description	Recommended Action
F1	Cut handpiece button may be stuck	1. Turn off, then turn on the generator. Do not press buttons or activate accessory devices during the self-test. 2. If the error code reappears, disconnect all accessories. Turn off, then turn on the generator again. 3. If the problem persists, replace the handpiece of footswitch and repeat the restart. 4. If the error code reappears, record the number and call Aaron customer service.
F2	Coag handpiece button may be stuck	
F3	Cut footswitch pedal may be stuck	
F4	Coag footswitch pedal may be stuck	
F5	Bipolar footswitch pedal may be stuck	
F6	Simultaneous activation error	The unit does not allow simultaneous activation of the cut and coagulation modes. The activation mode is "first come, first served." This means that whichever mode is selected first will be the function the unit is activated to dispense. An example of this functionality includes, when the handpiece Cut button is pressed, the unit is activated for Cut. If a footswitch is simultaneously pressed for Coag, the unit will continue in the Cut mode as long as the handpiece Cut button is pressed. If the Cut button is released, the unit will sense an error and both functions will be disabled. 1. Release either the cut or coag button on the handpiece, or the cut or coag pedal on the footswitch. 2. If the error code reappears, record the number and contact Aaron customer service.
E1	Output current out of specification	1. Turn the unit off. 2. Turn the unit on. 3. If the error code reappears, record the number and contact Aaron customer service.
E2	Dosage voltage error	
E3	Dosage current error	
E4	DC power error	
E5	Internal temperature of a section of the unit exceeded the limit.	1. Turn the unit off. 2. Allow the unit to cool for 20 minutes. 3. Turn the unit on. 4. If the error code reappears, record the number and contact Aaron customer service.
E6		
E7		
E8	NEM internal error	1. Turn the unit off. 2. Turn the unit on. 3. If the error code reappears, record the number and contact Aaron customer service.

CORRECTING COMMON PROBLEMS

If a solution is not readily apparent, use the table below to help identify and correct specific malfunctions. After you correct the malfunction, verify that the generator successfully completes the self-test.

Situation	Possible Cause	Recommended Action
Generator is on and the accessory is activated, but the generator does not deliver output power.	An error condition exists	1. Check the bipolar displays for an error code number. 2. Note the number and refer to the error codes descriptions in this section.
	Main board malfunction	1. Check and connect all connections from main board to display board. 2. Replace main board.
Footswitch will not activate output.	Malfunctioning or damaged footswitch receptacle	Replace the Footswitch connector assembly.
	Footswitch activation signal lost on main board.	1. Check/connect loose cable. 2. Replace the main board.
	Sensing circuit malfunction	Replace the display board.
Continuous monitor interference	Faulty chassis-to-ground connections	1. Check and correct the chassis ground connections for the monitor and, if applicable, for the generator. 2. Check other electrical equipment in the room for defective grounds.
	Electrical equipment is grounded to different objects rather than a common ground.	Plug all electrical equipment into line power at the same location.
	The generator may respond to the resulting voltage differences between grounded objects.	
	Malfunctioning monitor	Replace the monitor.
Interference with other devices only when generator is active.	Metal-to-metal sparking	Check all connections to the generator, patient return electrode, and accessories.
	High settings used for fulguration	Use lower power settings for fulguration or select the Coagulation mode.

Situation	Possible Cause	Recommended Action
Generator does not respond when turned on.	Disconnected power cord, faulty wall receptacle, or faulty power cord.	1. Check power cord connections (generator and wall receptacle). 2. Connect the power cord to a functional wall receptacle. If necessary, replace the power cord.
	Fuses blown	1. Check fuses. If necessary, replace fuse(s).
	Loose or disconnected internal cables	2. If a problem persists, use a backup generator. Check all internal connections.
	Faulty power switch	Replace the power switch.
	Faulty power supply	Replace power supply.
Generator is on, but will not activate.	An alarm condition exists.	Check the display for an error code. Note the number and refer to the Error Code list.
	Loose or disconnected internal cables	Check and connect all internal cables.
	Main board malfunction	1. Check and connect all connections from main board to display board. 2. Replace main board.
	Display board malfunction	Replace the display board.
	Relay board malfunction	Replace the relay board.
	Disconnected or faulty handpiece	Check or replace handpiece.
	Disconnected or faulty footswitch(s)	Check or connect faulty footswitch.
Activation and/or alarm tones do not sound; speaker is malfunctioning.	Loose or disconnected cable between main board and speaker board	Check/connect all connections from the speaker board to the main board.
	Main board malfunction	1. Check/connect all connections from the main board to the display board. 2. Replace the main board.
	Display board malfunction	Replace the display board.
	Speaker board malfunction	Replace the speaker board.

Situation	Possible Cause	Recommended Action
Interference with other devices only when generator is activated	Electrically inconsistent ground wires in the operating room If interference continues when the generator is activated, the monitor is responding to radiated frequencies.	Verify that all ground wires are as short as possible and go to the same grounded metal. Check with the manufacturer of the monitor. Some manufacturers offer choke filters for use in monitor leads. The filters reduce interference when the generator is activated and minimize the potential for an electrosurgical burn at the site of the monitor electrode.
Pacemaker interference	Intermittent connections or metal-to-metal sparking Current traveling from active to return electrode during monopolar electrosurgery is passing too close to pacemaker.	1. Check all connections to the generator. 2 It may be necessary to re-program the pacemaker. 1. Use bipolar instruments, is possible. If you must use a monopolar instrument, place the return electrode as close as possible to the surgical site. 2. Make sure the current path from the surgical site to the return electrode does not pass through the vicinity of the heart or the site where the pacemaker is implanted. 3. Always monitor patients with pacemakers during surgery and keep a defibrillator available. 4. Consult the pacemaker manufacturer or hospital. 5. Contact the Cardiology Department for further information when use of electrosurgical appliances is planned on patients with cardiac pacemakers.
Abnormal neuromuscular stimulation - *stop surgery immediately.*	Metal-to-metal sparking Can occur during coagulation Abnormal 50 Hz - 60 Hz leakage currents	Check all connections to the generator, patient plate, and active electrodes. Use a lower setting for the Fulguration mode or select the Coagulation mode. Inside the generator, carefully inspect for damage that may cause shorting between the AC line voltage and connected patient components.
Blank or confusing LED display Mode buttons do not operate properly when pressed.	Display board malfunction Damaged front panel overlay Loose or disconnected internal cable Power supply malfunction Main board malfunction	Replace the display board. Replace front panel overlay. Check/connect overlay cable to display board. Replace power supply. Replace the main board.

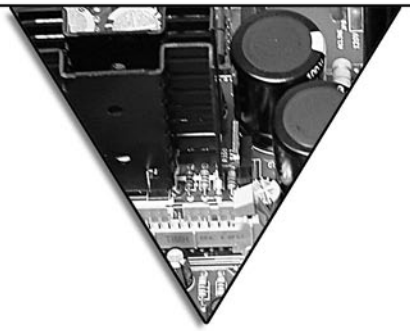
Situation	Possible Cause	Recommended Action
Generator is on and the accessory is activated, but the generator does not deliver output.	Malfunctioning footswitch or handswitching instrument	1. Turn off the generator. Check and correct all accessory connections. 2. Turn on the generator 3. Replace the accessory if it continues to malfunction.
	Power set too low	Increase the power setting.
	Display board malfunction	Replace the display board.
	Main board malfunction	Replace main board.
	Relay board malfunction	Replace main board.
	NEM alarm	1. Check/connect the Return Electrode connection to the patient and connection to the generator. 2. Replace Return Electrode

MAIN BOARD TEST POINTS

Test Point	Description
TP1	High Voltage AC
TP2	380 VDC
TP3	HV Ground
TP4	3.3 VDC
TP5	5.0 VDC
TP6	2.5 VDC
TP7	12 VDC
TP8	LV Ground
TP9	(-12 VDC)
TP10	LV Ground
TP12	Relay Ground
TP13	Ground
TP14	VAUX_SMPS
TP15	RF Drive 2
TP16	Turns Ratio T14
TP19	Ground
TP20	Power Ground
TP21	Ground
TP22	Turns Ration T14
TP23	RF Drive 1
TP24	Monopolar Return
TP25	Ground
TP26	Active Damping
TP27	SMPS VSS
TP28	Power Ground
TP29	SMPS Ground
TP30	SMPS Drive 1
TP31	SMPS Drive 2
TP32	Ground

DISPLAY BOARD TEST POINTS

Test Point	Description
TP1	Ground
TP2 - TP9	Reserved



SECTION 8

REPAIR POLICY AND PROCEDURES

Refer to this section for information on:

- *Responsibility of the Manufacturer*
- *Returning the Generator for Service*

RESPONSIBILITY OF THE MANUFACTURER

Aaron Medical is responsible for the safety, reliability, and performance of the generator only under the following circumstances:

- The user has followed the Installation and Setup Procedures in this Service Guide.
- Persons authorized by Aaron Medical performed assembly operation, readjustments, modifications, or repairs.
- The electrical installation of the relevant room complies with local codes and regulatory requirements, such as IEC and BSI.
- Equipment use is in accordance with the Aaron Medical instructions for use.

For warranty information, refer to *Appendix A - Warranty*.

RETURNING THE GENERATOR FOR SERVICE

Before you return the generator, call your Aaron Medical representative for assistance. If instructed to send the generator to Aaron Medical, first obtain a Returned Goods Authorization Number. Then, clean the Generator and ship it to Aaron Medical for service.

Step 1 – Obtain a Returned Goods Authorization Number

Call the Aaron Medical Customer Service Center to obtain a Returned Goods Authorization Number. Have the following information ready when you call:

- Hospital / clinic name / customer number
- Telephone number
- Department / address, city, state, and zip code
- Model number & Serial number
- Description of the problem
- Type of repair to be done

Step 2 – Clean the Generator

WARNING:

Electric Shock Hazard - Always turn off and unplug the generator before cleaning.

NOTICE:

Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.

A. Turn off the generator, and unplug the power cord from the wall outlet.

B. Thoroughly wipe all surfaces of the generator and power cord with a mild cleaning solution or disinfectant and a damp cloth. Follow the procedures approved by your institution or use a validated infection control procedure. Do not allow fluids to enter the chassis. You cannot sterilize the generator.

Step 3 – Ship the Generator

A. Attach a tag to the generator that includes the Returned Goods Authorization Number and the information (hospital, phone number, etc.) listed in *Step 1 – Obtain a Returned Goods Authorization Number*.

B. Be sure the generator is completely dry before you pack it for shipment. Package it in its original shipping container, if available.

C. Ship the generator, prepaid, to the address given to you by the Aaron Medical Service Center.

APPENDIX A

WARRANTY

Aaron Medical warrants each product manufactured by it to be free from defects in material and workmanship under normal use and service for the period(s) set forth below.

Aaron Medical's obligation under this warranty is limited to the repair or replacement, at its sole option, of any product, or part thereof, which has been returned to it or its Distributor within the applicable time period shown below after delivery of the product to the original purchaser, and which examination discloses, to Aaron Medical's satisfaction, that the product is indeed, defective.

This warranty does not apply to any product, or part thereof, which has been repaired or altered outside Aaron Medical's factory in a way so as, in Aaron Medical's judgment, to affect its stability or reliability, or which has been subjected to misuse, neglect, or accident.

The warranty periods for Aaron Medical products are as follows:

- Electrosurgical Generators: One year from date of shipment
- Mounting Fixtures (all models): One year from date of shipment
- Footswitches (all models): Ninety days from date of shipment
- Patient Return Electrodes: Shelf life only as stated on packaging
- Sterile Single Use Accessories: Only as stated on packaging

This warranty is in lieu of all other warranties, express or implied, including without limitation, the warranties of merchantability and fitness for a particular purpose, and of all other obligations or liabilities on the part of Aaron Medical.

Aaron Medical neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale or use of any of Aaron Medical's products.

Notwithstanding any other provision herein or in any other document or communication, Aaron Medical's liability with respect to this agreement and products sold hereunder shall be limited to the aggregate purchase price for the goods sold by Aaron Medical to the customer.

There are no warranties which extend beyond the terms hereof.

Aaron Medical disclaims any liability hereunder or elsewhere in connection with the sale of this product, for indirect or consequential damages.

This warranty and the rights and obligations hereunder shall be construed under and governed by the laws of the State of Florida, USA.

The sole forum for resolving disputes arising under or relating in any way to this warranty is the District Court of the County of Pinellas, State of Florida, USA.

Aaron Medical, its dealers, and representatives reserve the right to make changes in equipment built and/or sold by them at any time without incurring any obligation to make the same or similar changes on equipment previously built and/or sold by them.

APPENDIX B

BOARD DRAWINGS, SCHEMATICS, & ASSEMBLIES

HOW TO ORDER PARTS FROM AARON MEDICAL

Once you have determined what parts you need from the drawings and Bill of Materials, call our Technical Service Department.

Our trained staff will verify the part numbers and arrange immediate delivery. The Technical Service Department can relay cost information, determine parts availability, and suggest any assembly updates available.

AARON 2250 DESIGN BREAKDOWN AND DRAWING REFERENCE

PCB ASSEMBLIES	
P/N	**Description**
20-057-001	HV Relay PCB
20-058-001	Main PCB Assembly
20-056-002	PCB Assembly Display
25-044-001	Connector Assembly Bipolar Foot-control
18-076-003	Back Panel Assembly
18-075-225	Front Panel Assembly
20-055-001	PCB Assembly Power Supply 40 W
Enclosure	
P/N	**Description**
10-088-001	Frame Side Support
10-087-001	Frame Lower Support
10-083-002	Upper Frame Support
10-084-003	Base Plate
05-039-005	Rubber Feet 0.78125" (Outer Diameter)
10-086-003	Outer Cover
10-087-002	Lower Support Frame
06-065-005	Front Panel Molding (Soft Grey)
10-085-003	Back Panel
CONNECTORS	
P/N	**Description**
21-100-001	Connector W/O.093 Pins Neutral (Electrode Assembly)
25-043-001	Foot Control Connector Assembly
25-042-001	Monopolar Connector Assembly
21-140-001	Bipolar Connector Assembly
25-045-001	Connector Assembly Monopolar Foot-Controlled
CABLES	
P/N	**Description**
25-048-001	Cable Assembly Power Supply (Input)
25-049-001	Cable Assembly Power Supply (Output)
25-053-001	Cable Assembly HV Relay Board (Interconnect)
25-051-002	Cable Assembly Temperature Sensor (Short)
25-055-001	Cable Assembly HV Relay Board (Control)
25-051-001	Cable Assembly Temperature Sensor
21-144-001	Cable Assembly Display Ribbon
25-047-001	Cable Assembly Display Power

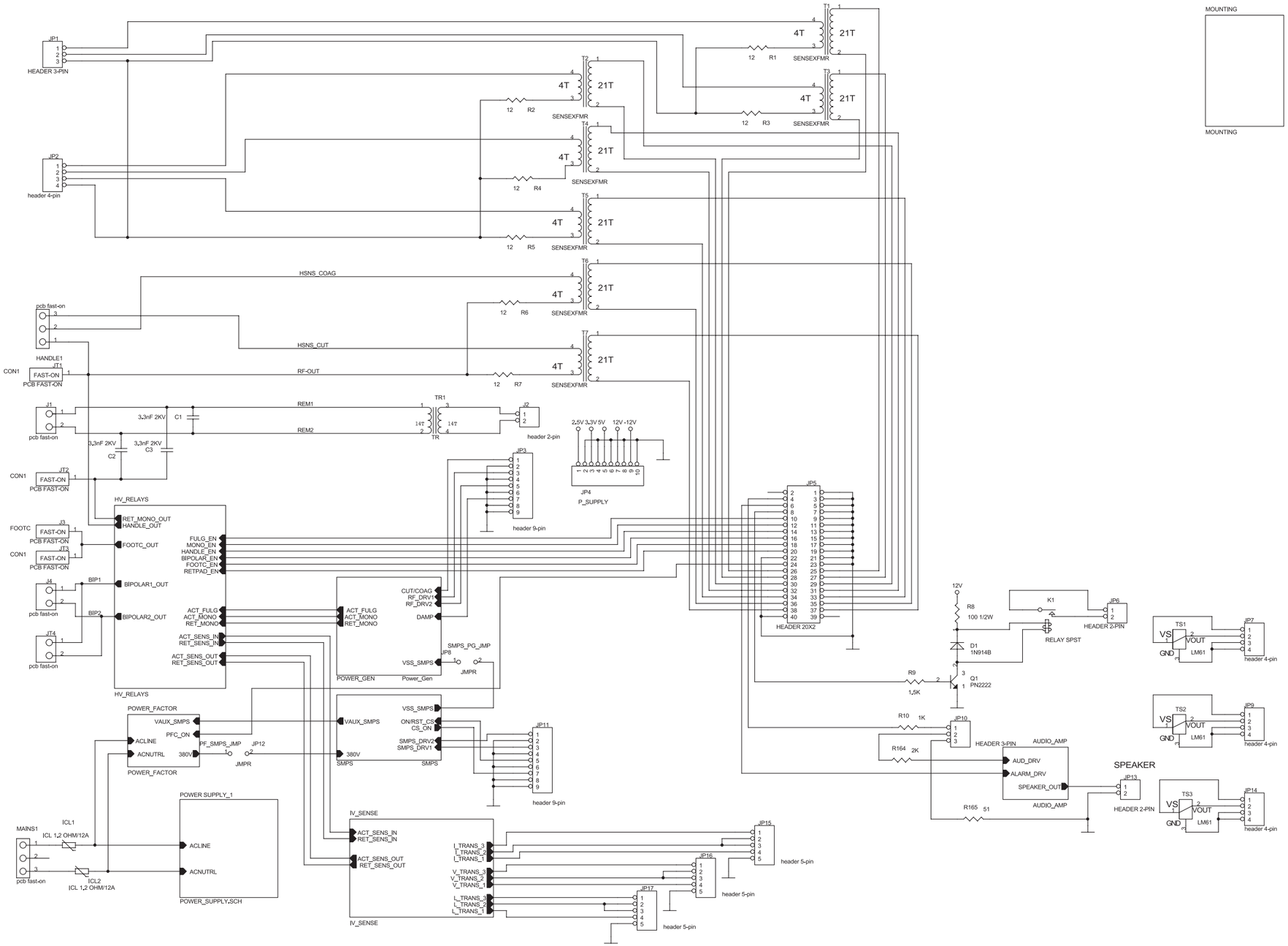
CABLES	
P/N	Description
25-054-001	Cable Assembly SMPS/PG Drive
25-052-001	Cable Assembly Voltage/Current (Sensor)
25-050-001	Cable Assembly NEM
21-086-001	Hypertronic 4-Pin Plug Assembly
25-046-003	5 Inch Ground Cable (¼ Insulation)
25-046-001	5 Inch Ground Cable (⅜ Connector)
21-141-001	Power Harness IDS
MISC.	
P/N	Description
07-044-001	On/Off Switch DPST Blk Snap-Mount
15-182-001	Overlay Button
15-181-001	Overlay Top
07-094-002	Power Entry Module Filtered
02-033-002	Fuse 5 x 20 250 Volt Time Lag 6.3 Amp
15-176-001	Back Panel Label
04-080-001	Brass Grounding Stud

AARON DRAWING AND SCHEMATIC PACKAGE

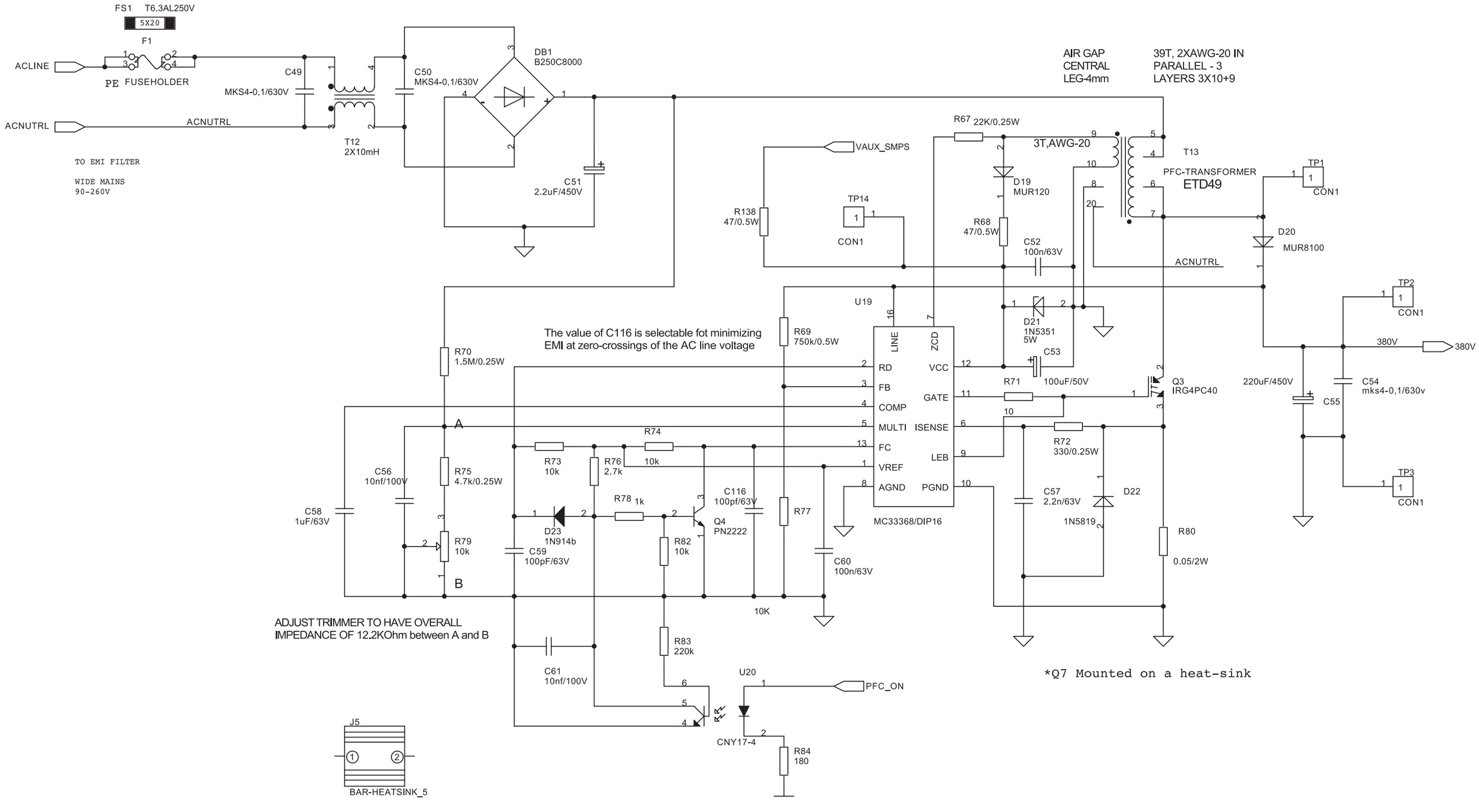
Following tri-folds.

List for Cabling in Assembly Drawing - Refer to page B-31		
REFERENCE DESIGNATORS FOR WIRING		
Referenced Part	Connected From	Connected To
BACK PANEL, ITEM 19	2 PIN, SPEAKER ASSY	JP13 (MAIN PCB) - ITEM 5
	3 PIN, SPEAKER ASSY	JP10 (MAIN PCB) - ITEM 5
	3 PIN, BIPOLAR CONNECTOR	JP1 (MAIN PCB) - ITEM 5
	4 PIN, MONOPOLAR CONNECTOR	JP2 (MAIN PCB) - ITEM 5
CABLE, ITEM 35	SW1-A1 (MAIN PCB) - ITEM ITEM 5	2 PIN (POWER SUPPLY) - ITEM 14
CABLE, ITEM 36	SW1-B1 (MAIN PCB) - ITEM ITEM 5	8 PIN (POWER SUPPLY) - ITEM 14
CABLE, ITEM 37	ACT_SNS (RELAY PCB) - ITEM 1	ACT_SNS (MAIN PCB) - ITEM 5
	HVC1 (RELAY PCB) - ITEM 1	HVC2 (MAIN PCB) - ITEM 5
CABLE, ITEM 38	JP7 (MAIN PCB) - ITEM 5	JP22 (DISPLAY PCB) - ITEM 6
CABLE, ITEM 39	JP19 (MAIN PCB) - ITEM 5	JP18 (RELAY PCB) - ITEM 1
CABLE, ITEM 40	JP9 (MAIN PCB) - ITEM 5	JP20 (DISPLAY PCB) - ITEM 6
	JP14 (MAIN PCB) - ITEM 5	JP21 (DISPLAY PCB) - ITEM 6
CABLE, ITEM 41	JP5 (MAIN PCB) - ITEM 5	JP2 (DISPLAY PCB) - ITEM 6
CABLE, ITEM 42	JP3 (MAIN PCB) - ITEM 5	JP10 (DISPLAY PCB) - ITEM 6
	JP11 (MAIN PCB) - ITEM 5	JP9 (DISPLAY PCB) - ITEM 6
CABLE, ITEM 43	JP4 (MAIN PCB) - ITEM 5	JP23 (DISPLAY PCB) - ITEM 6
CABLE, ITEM 44	JP16 (MAIN PCB) - ITEM 5	JP4 (DISPLAY PCB) - ITEM 6
	JP15 (MAIN PCB) - ITEM 5	JP3 (MAIN PCB) - ITEM 5
CABLE, ITEM 45	J2 (MAIN PCB) - ITEM 5	JP1 (DISPLAY PCB) - ITEM 6
FRONT PANEL, ITEM 6	NEUTRAL CONNECTOR - 1	J1, REM2 (MAIN PCB) - ITEM 5
	NEUTRAL CONNECTOR - 2	J1, REM1 (MAIN PCB) - ITEM 5
	FOOT-CONTROL CONNECTOR - 3	J3, FOOT-CTRL (MAIN PCB) - ITEM 5
	MONOPOLAR CONNECTOR - 4	HANDLE1, H-ACT (MAIN PCB) - ITEM 5
	MONOPOLAR CONNECTOR - 5	HANDLE1, H-COAG (MAIN PCB) - ITEM 5
	MONOPOLAR CONNECTOR - 6	HANDLE1, H-CUT (MAIN PCB) - ITEM 5
	BIPOLAR CONNECTOR - 7	J4, BIP1 (MAIN PCB) - ITEM 5
	BIPOLAR CONNECTOR - 8	J4, BIP2 (MAIN PCB) - ITEM 5
RELAY PCB, ITEM 1	RELAY, U8	JT4, BIP_IN2 (MAIN PCB) - ITEM 5
	RELAY, U2	JT4, BIP_IN1 (MAIN PCB) - ITEM 5
	RELAY, U4	HANDLE1, JT1 (MAIN PCB) - ITEM 5
	RELAY, U7	FOOT-CTRL, JT3 (MAIN PCB) - ITEM 5
	RELAY, U11	JT2 (MAIN PCB) - ITEM 5
POWER HARNESS, BACK PANEL, ITEM 19	HARNESS - BLUE WIRE	MAINS (MAIN PCB) - ITEM 5 - OUTER
	HARNESS - YELLOW WIRE	MAINS (MAIN PCB) - ITEM 5 - INNER

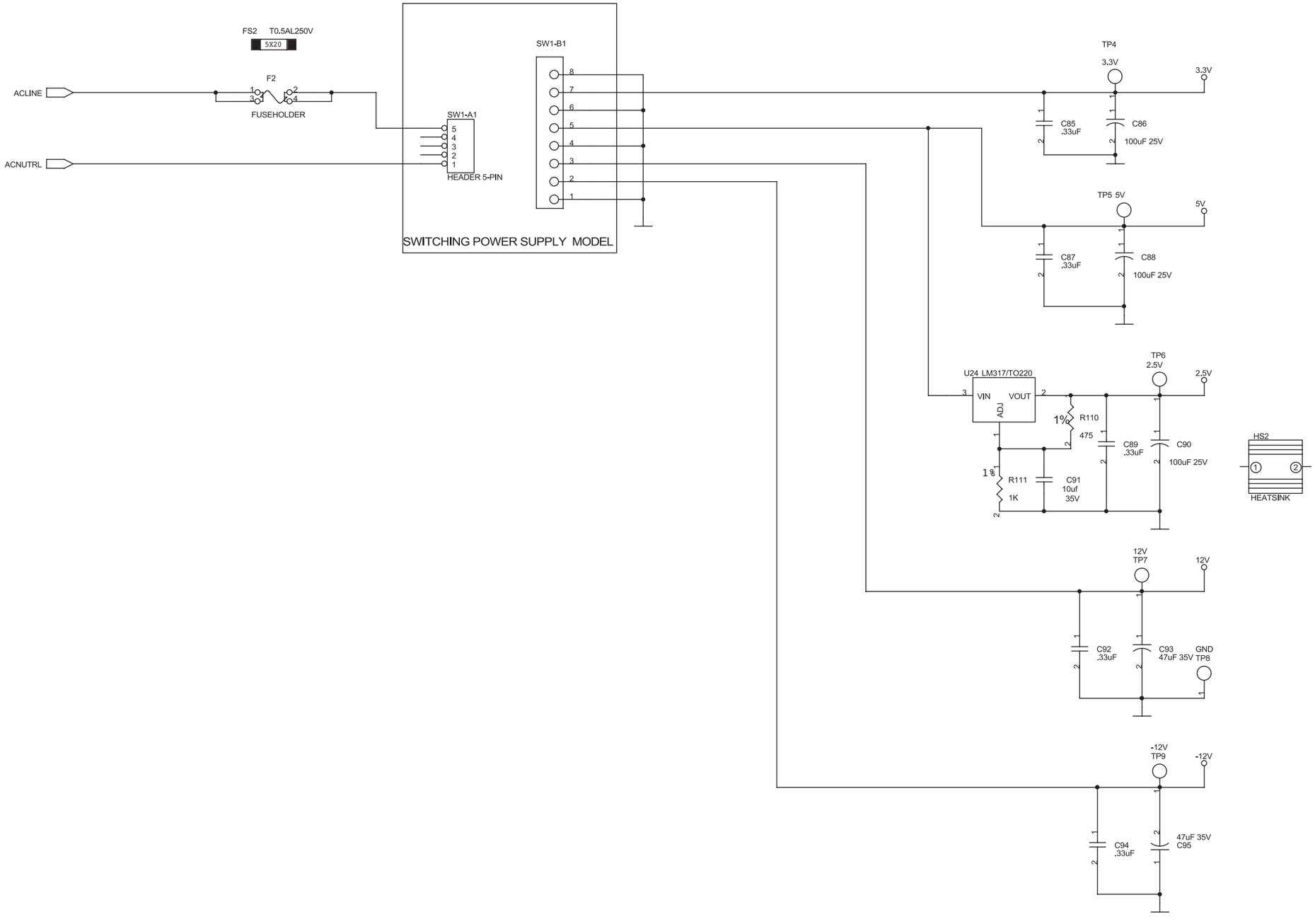
Main Board Schematic Block Diagram



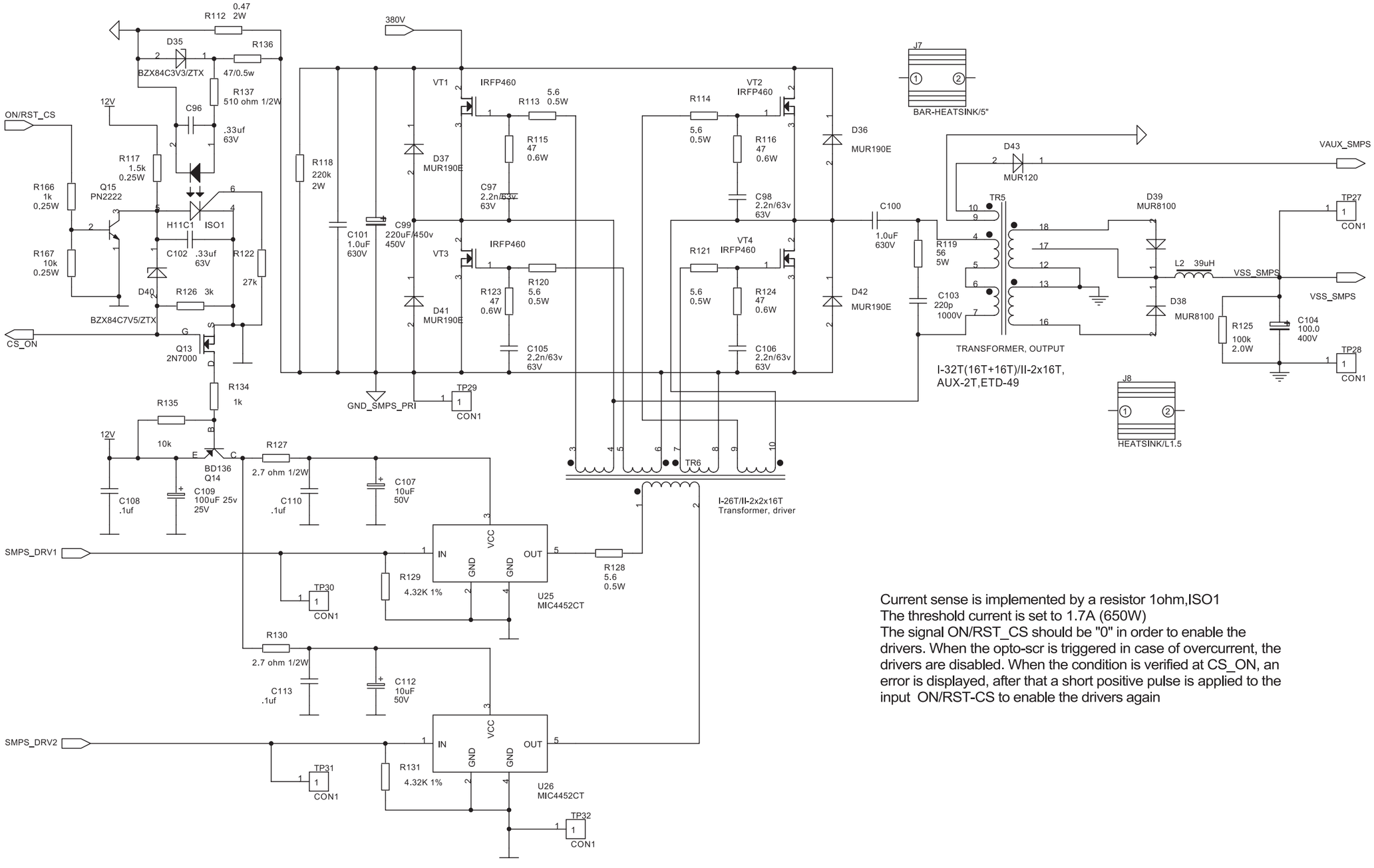
Power Factor Circuit



Power Supply Circuit

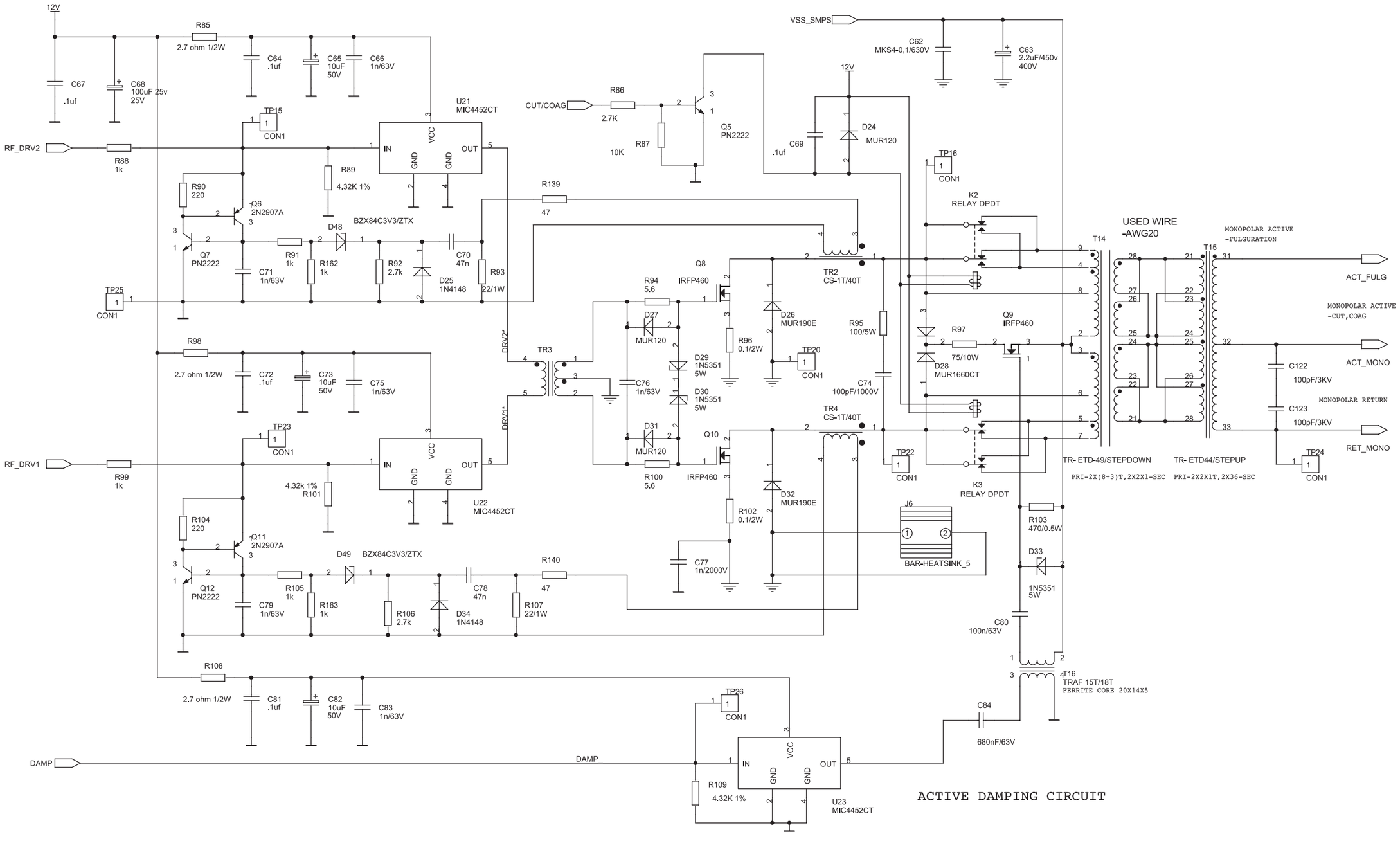


SMPS Circuit

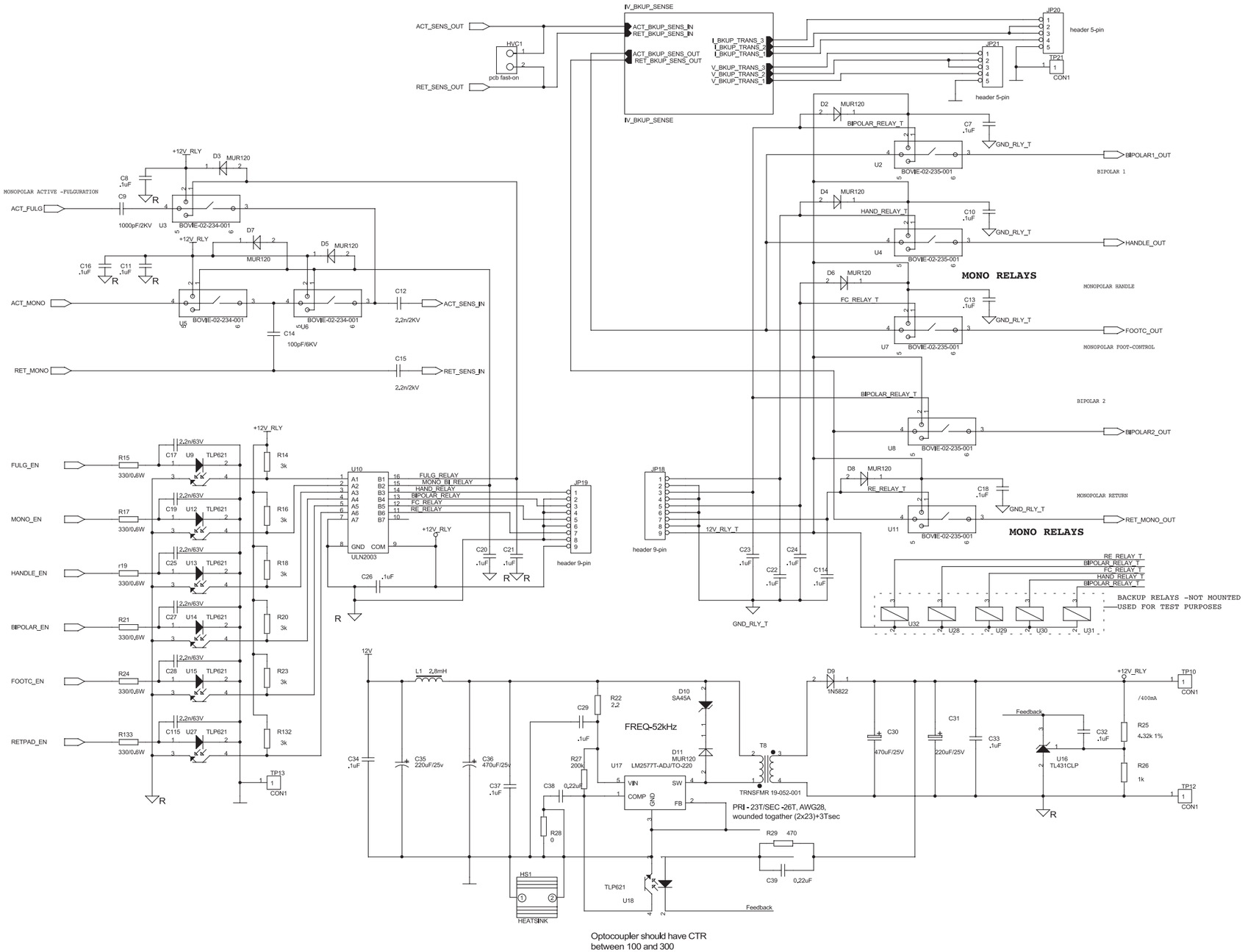


Current sense is implemented by a resistor 1ohm,ISO1
The threshold current is set to 1.7A (650W)
The signal ON/RST_CS should be "0" in order to enable the drivers. When the opto-scr is triggered in case of overcurrent, the drivers are disabled. When the condition is verified at CS_ON, an error is displayed, after that a short positive pulse is applied to the input ON/RST-CS to enable the drivers again

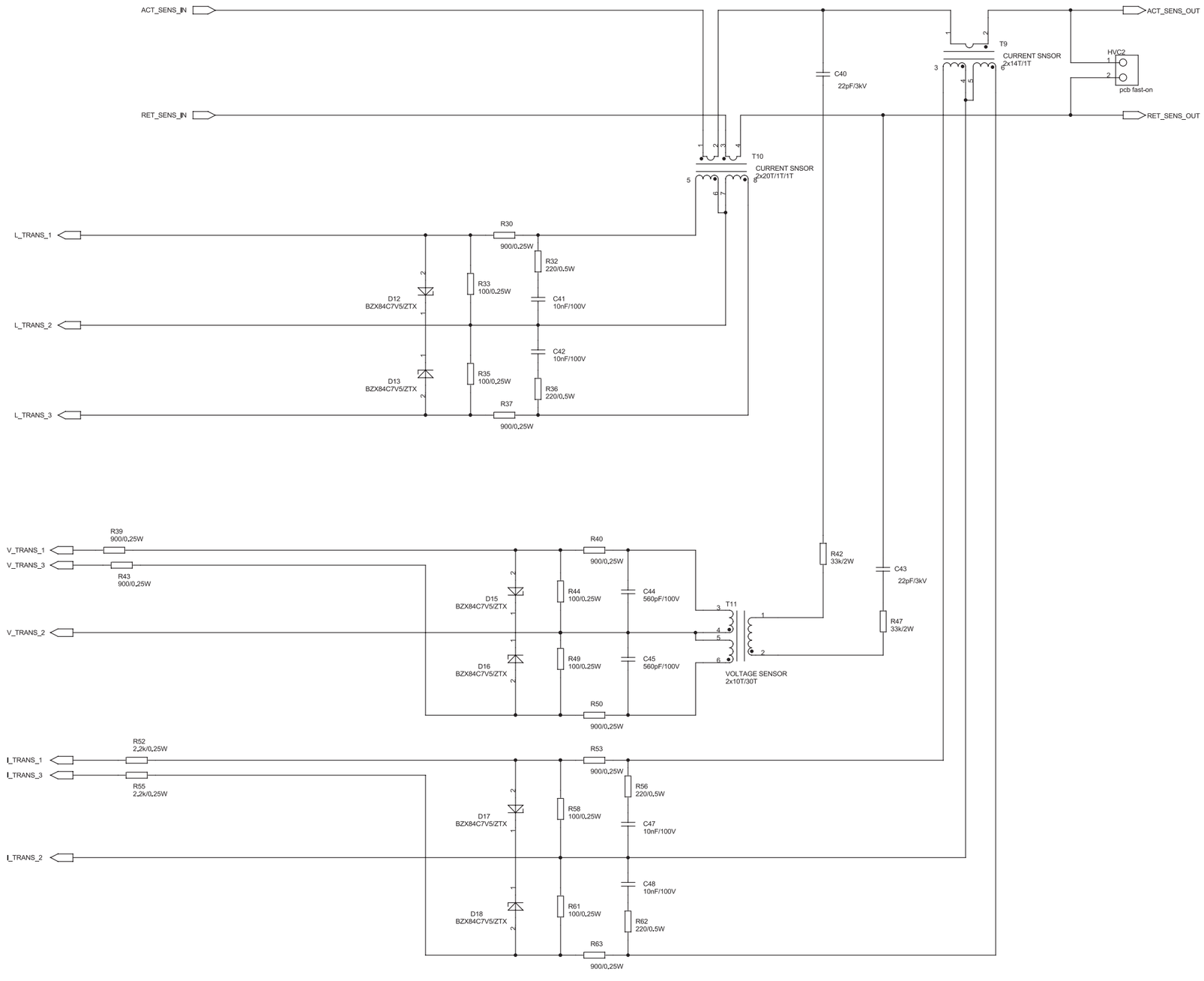
Power Generator Circuit



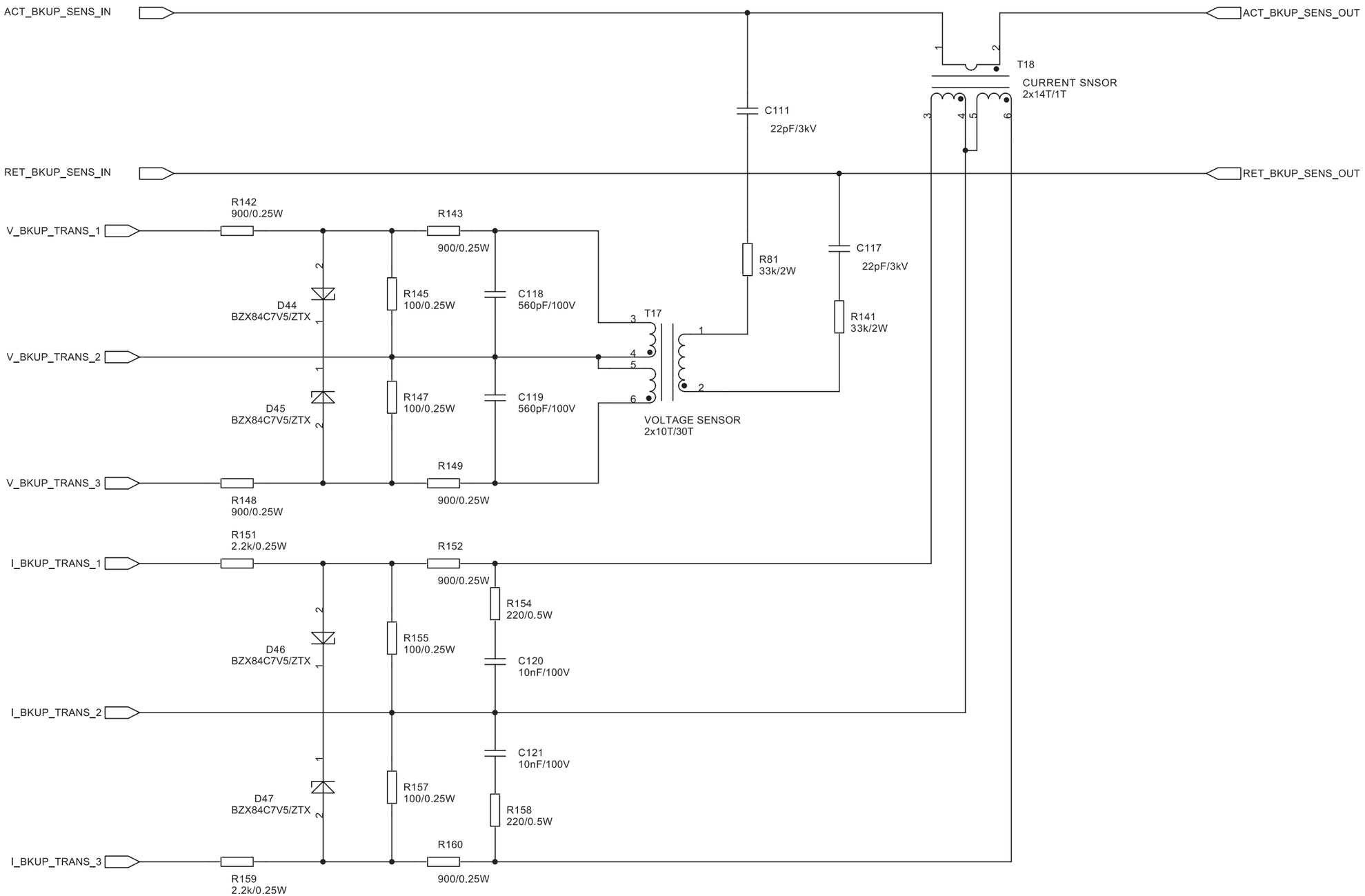
High Voltage Relays Circuit



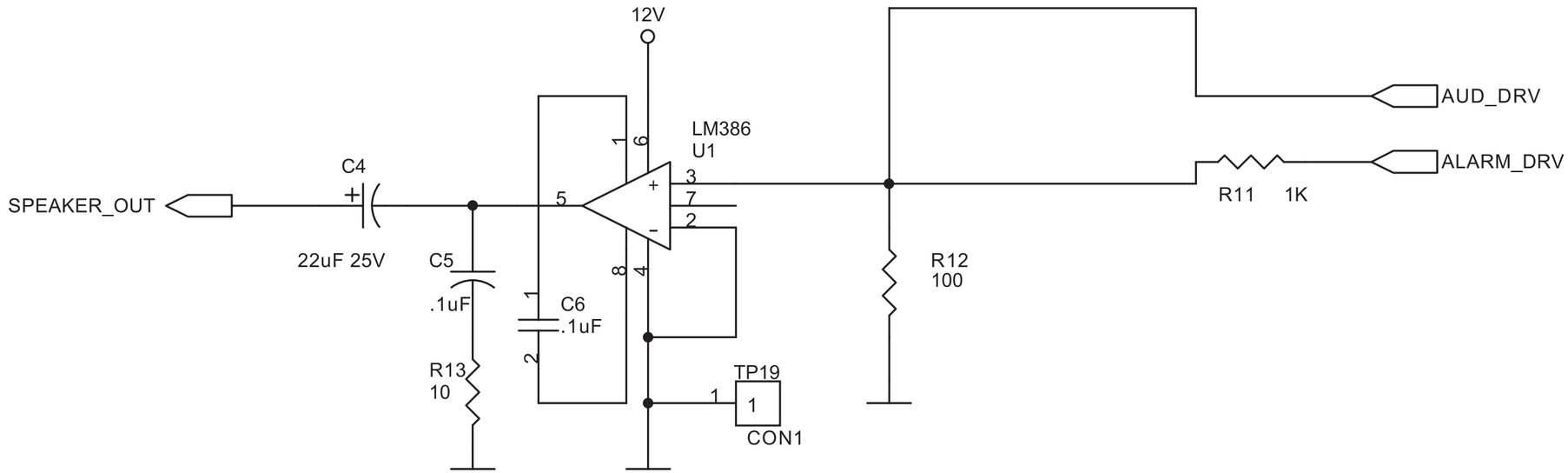
Current / Voltage Sensors Circuit



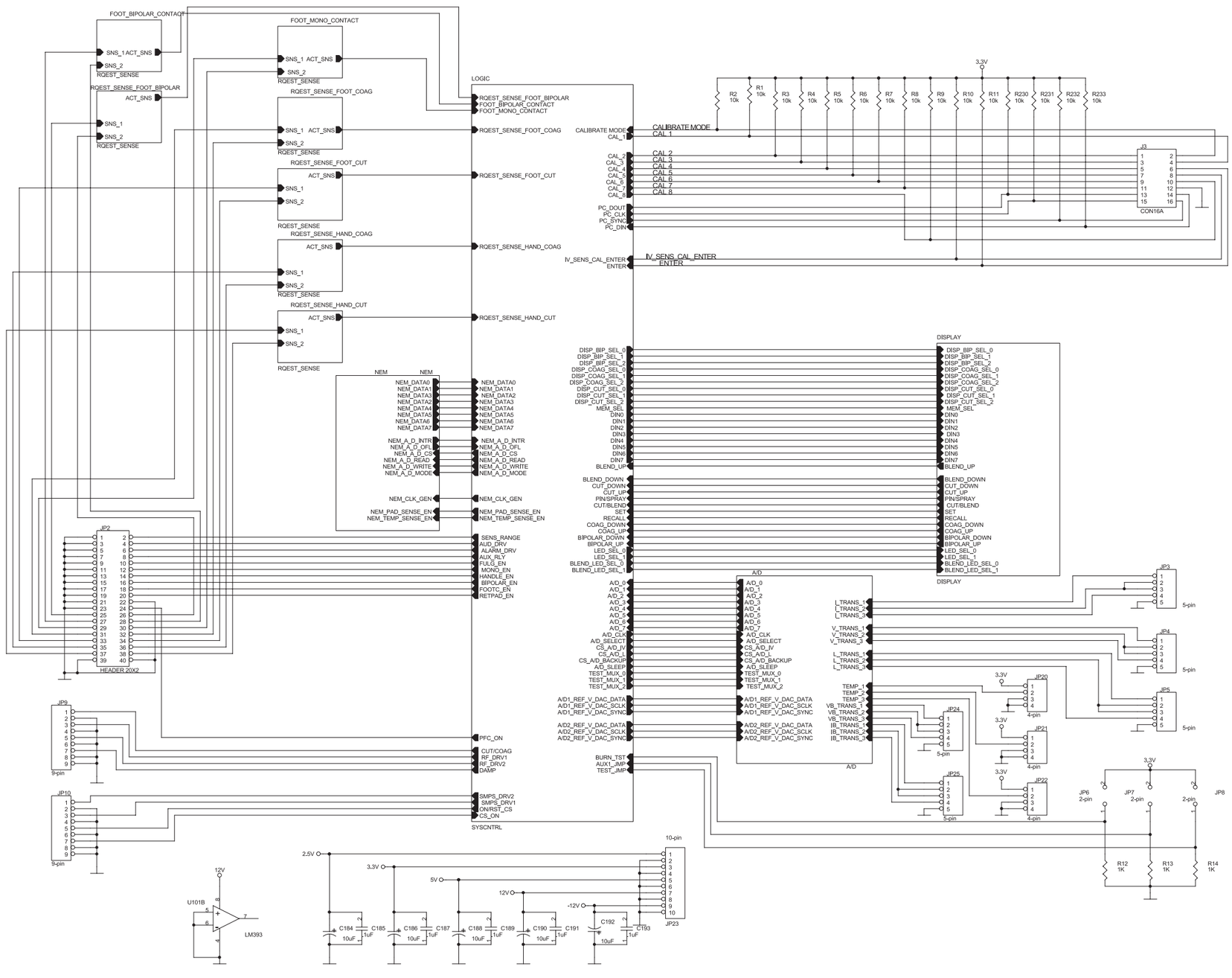
Current / Voltage Sensors (Backup) Circuit



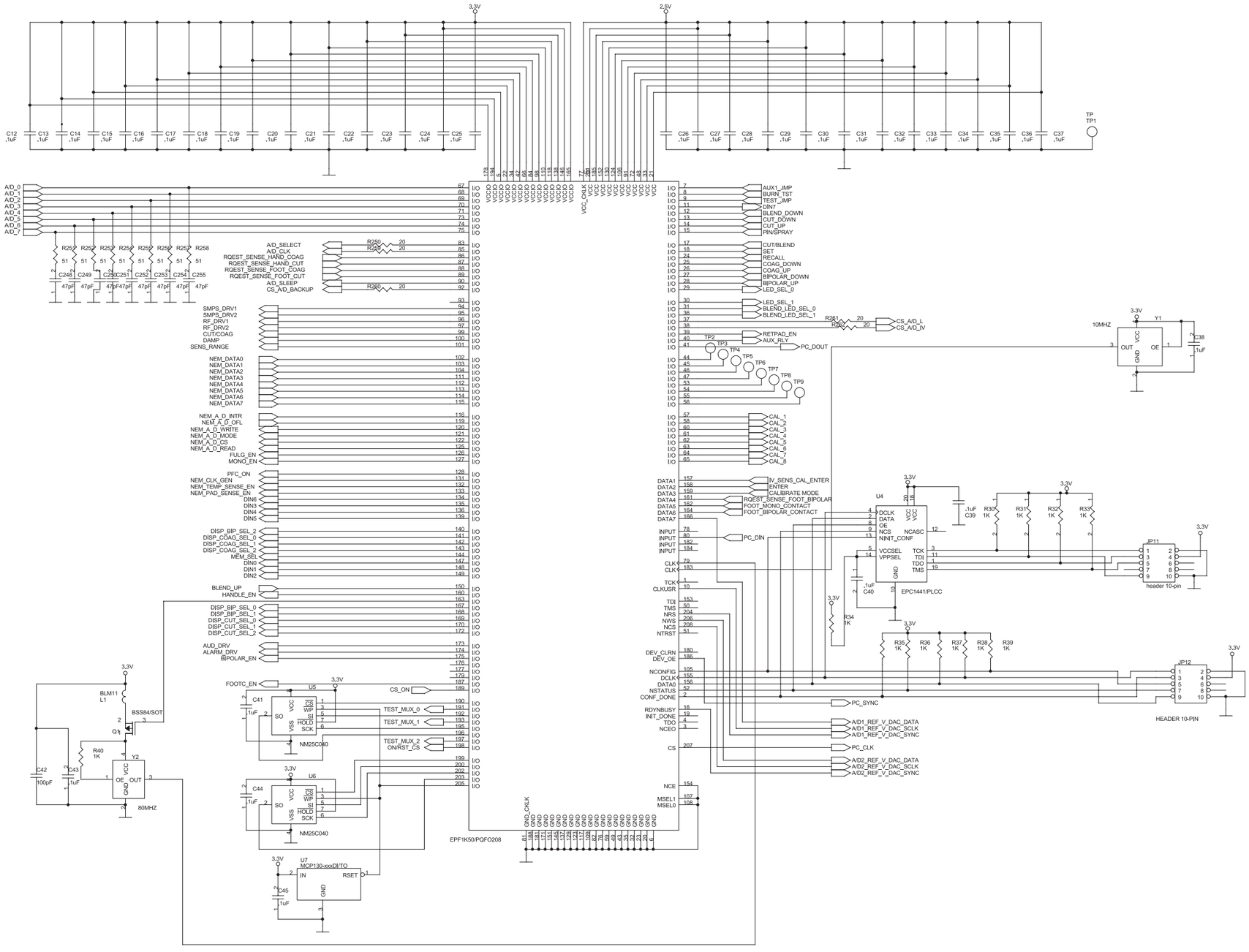
Audio Amplifier Circuit



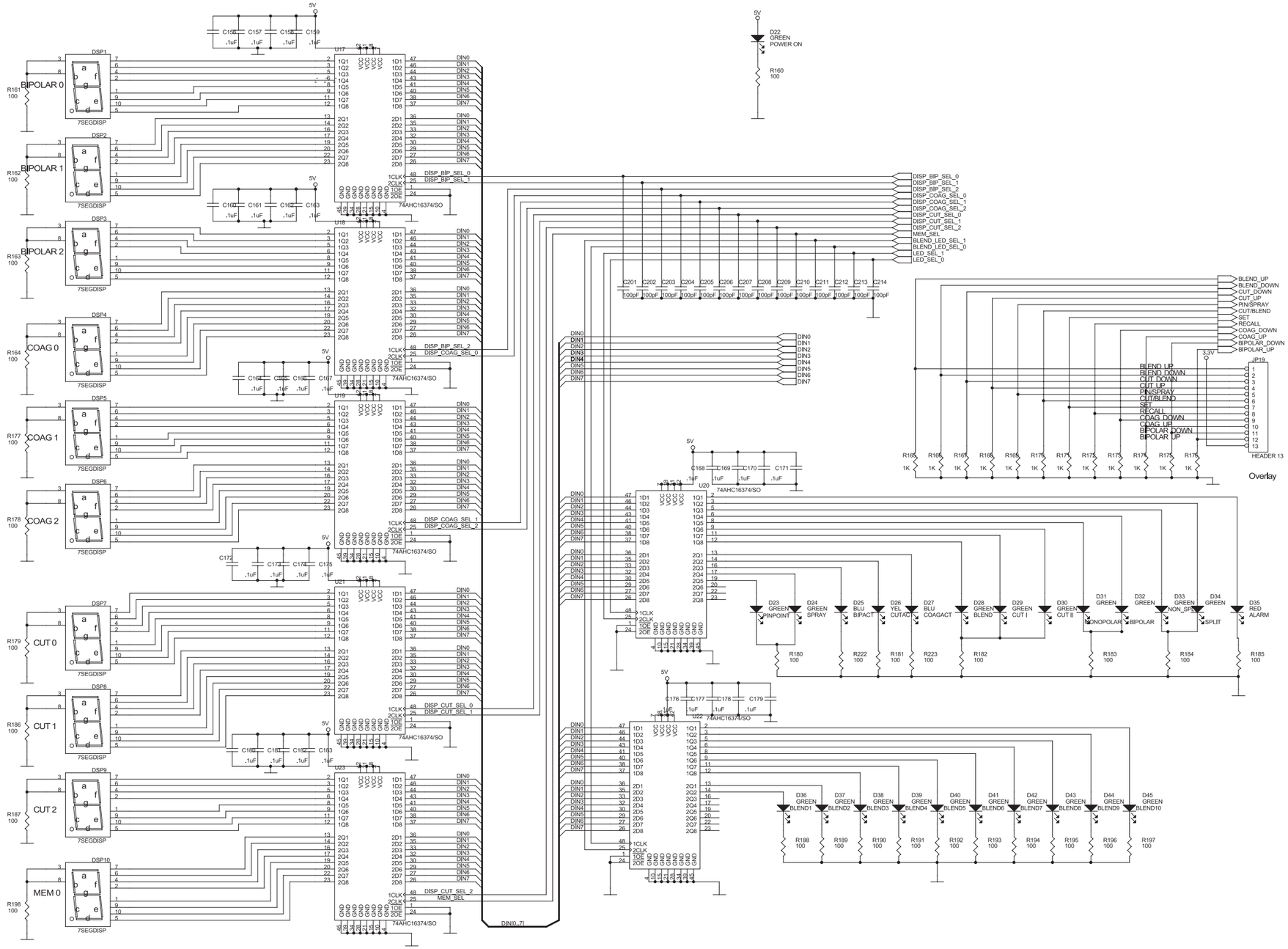
Display Block Diagram



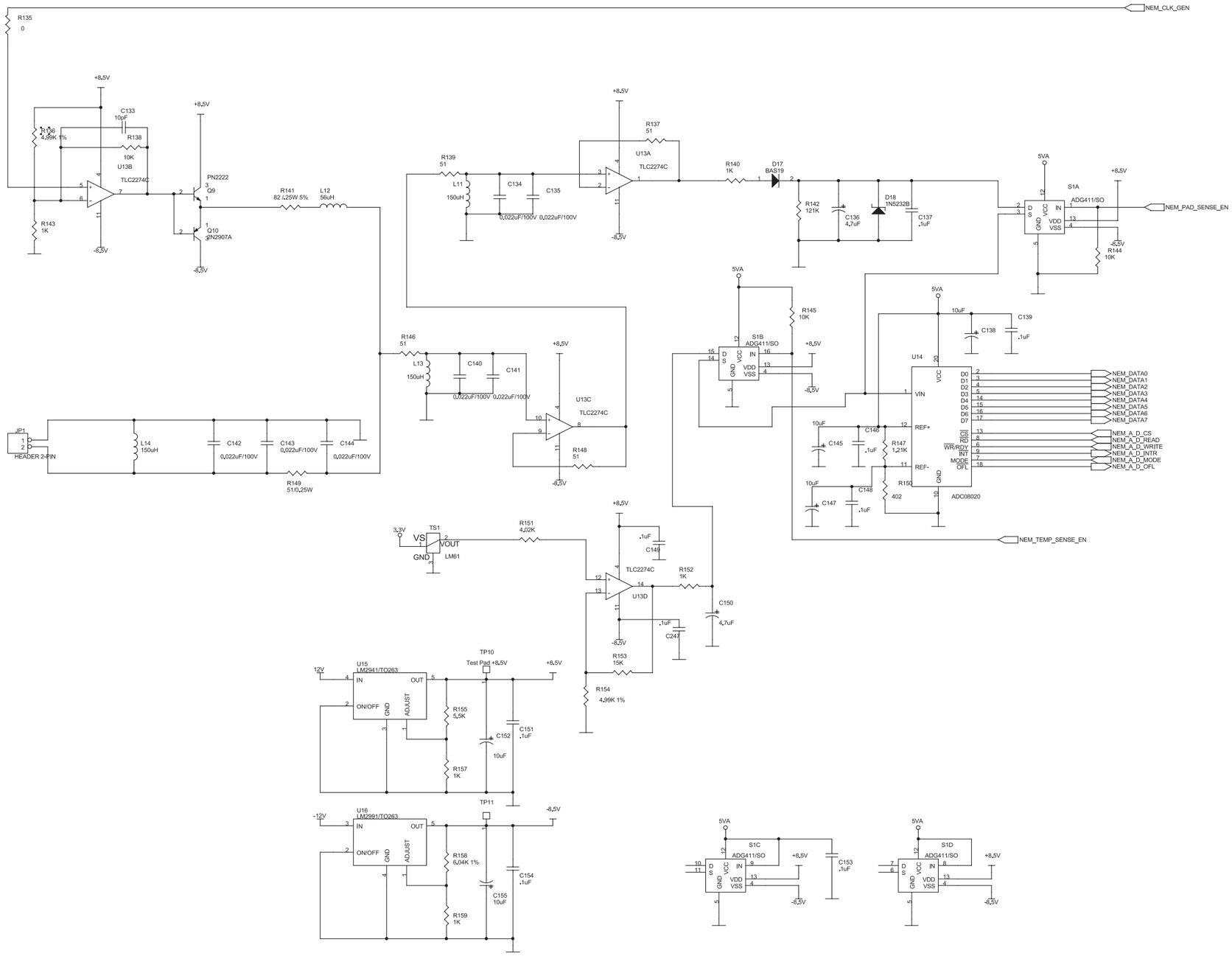
System Logic Circuit



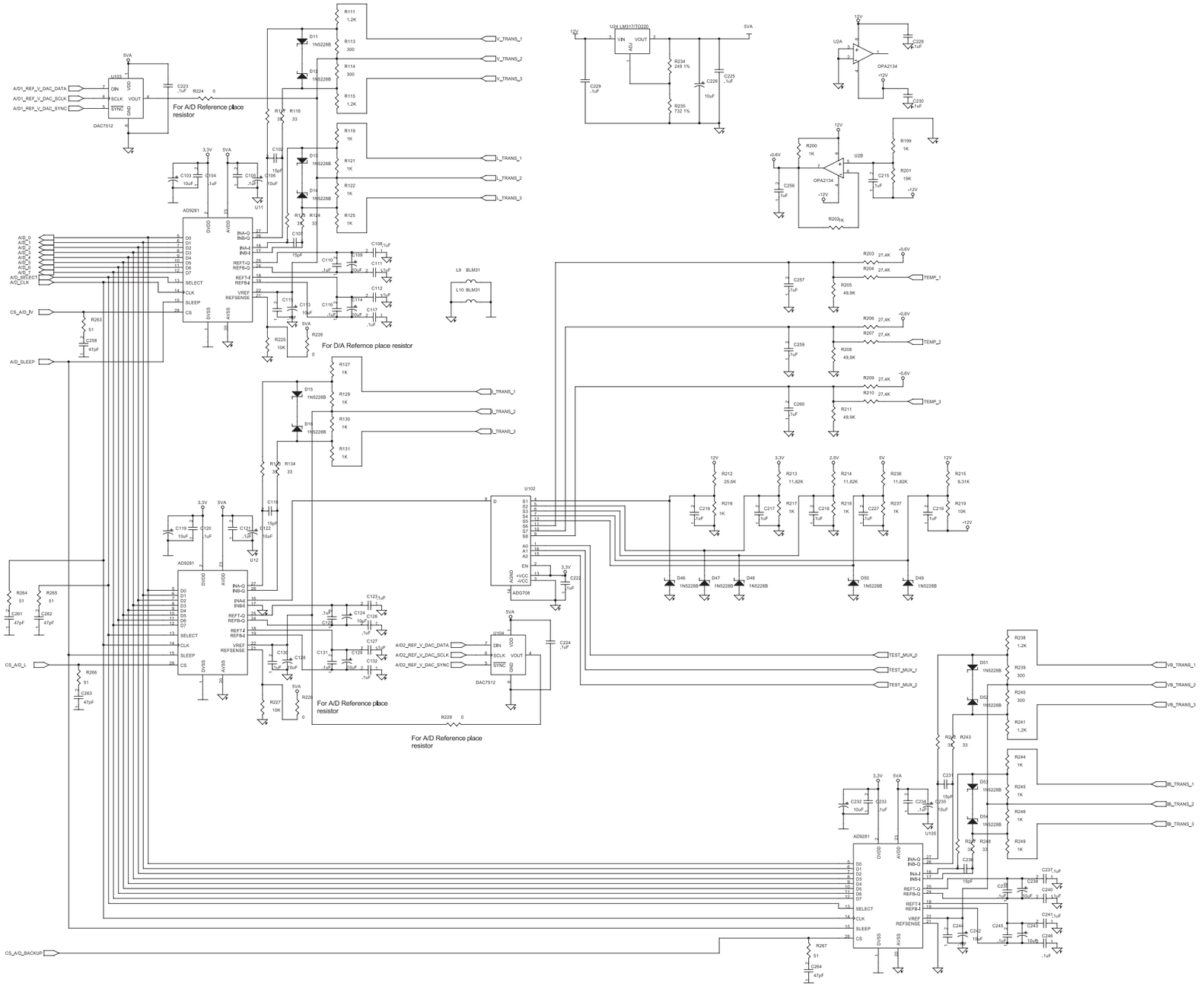
Display Control Circuit



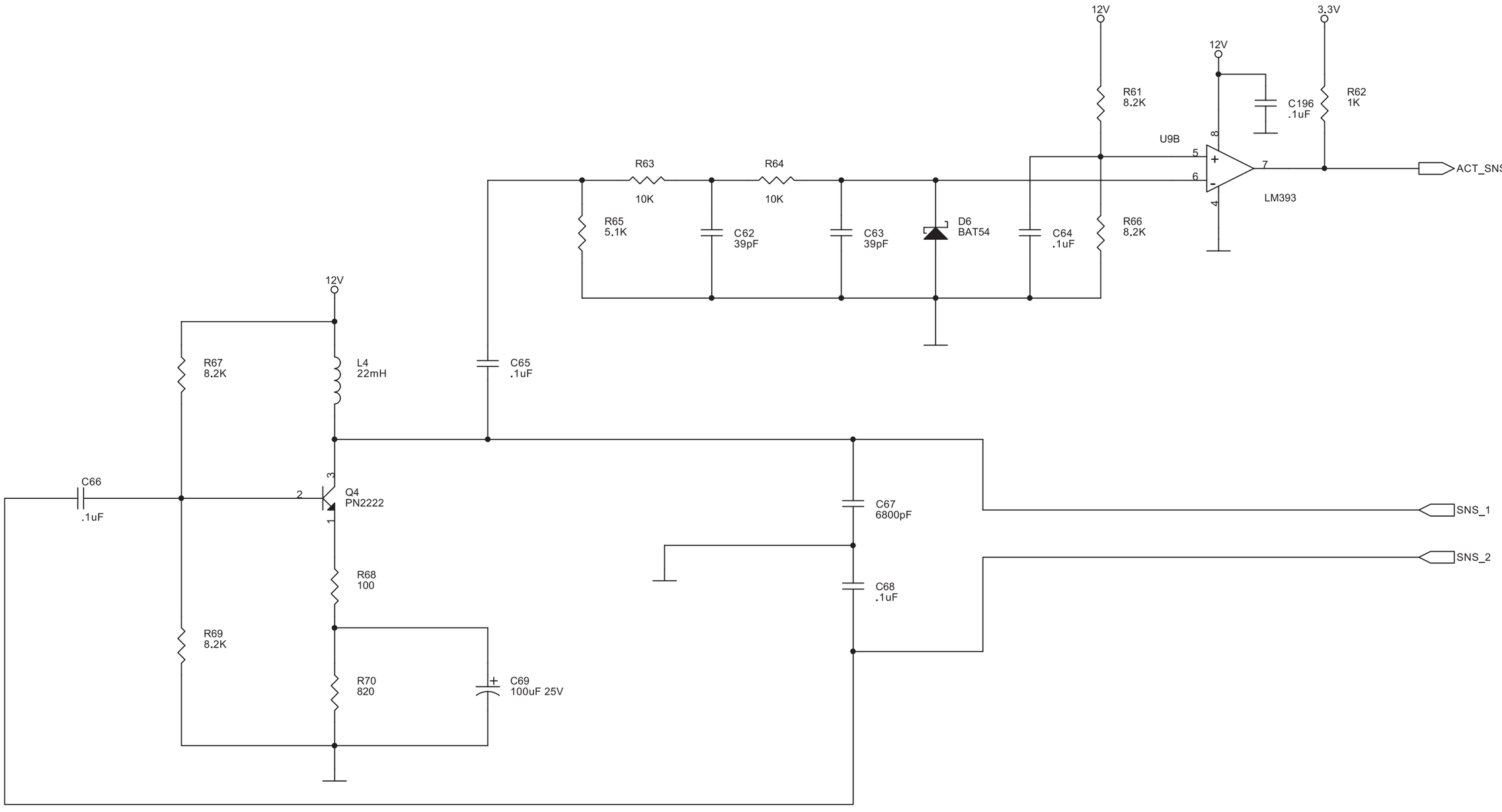
Neutral Electrode Monitoring Circuit



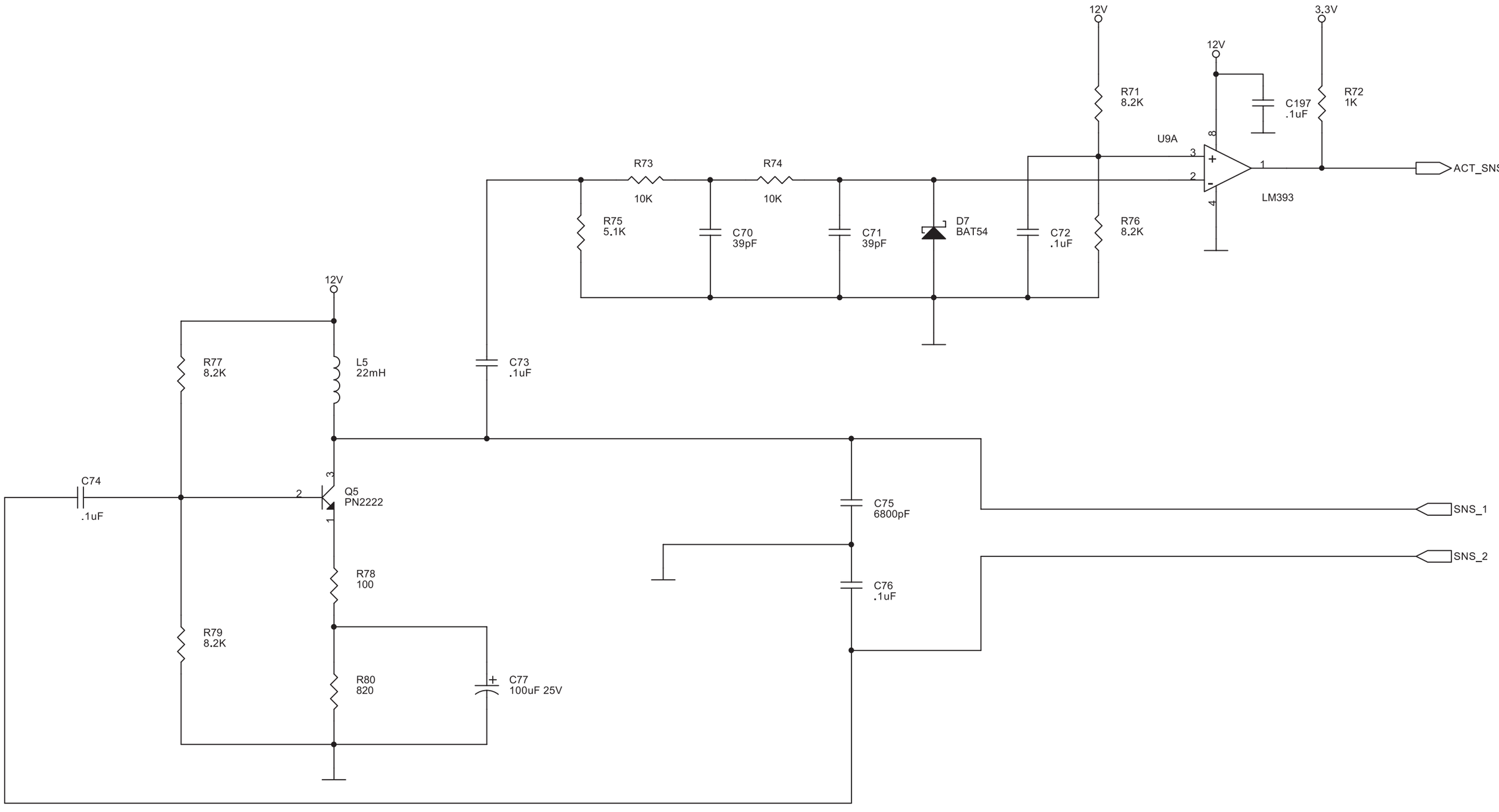
Analog to Digital Converter Circuit



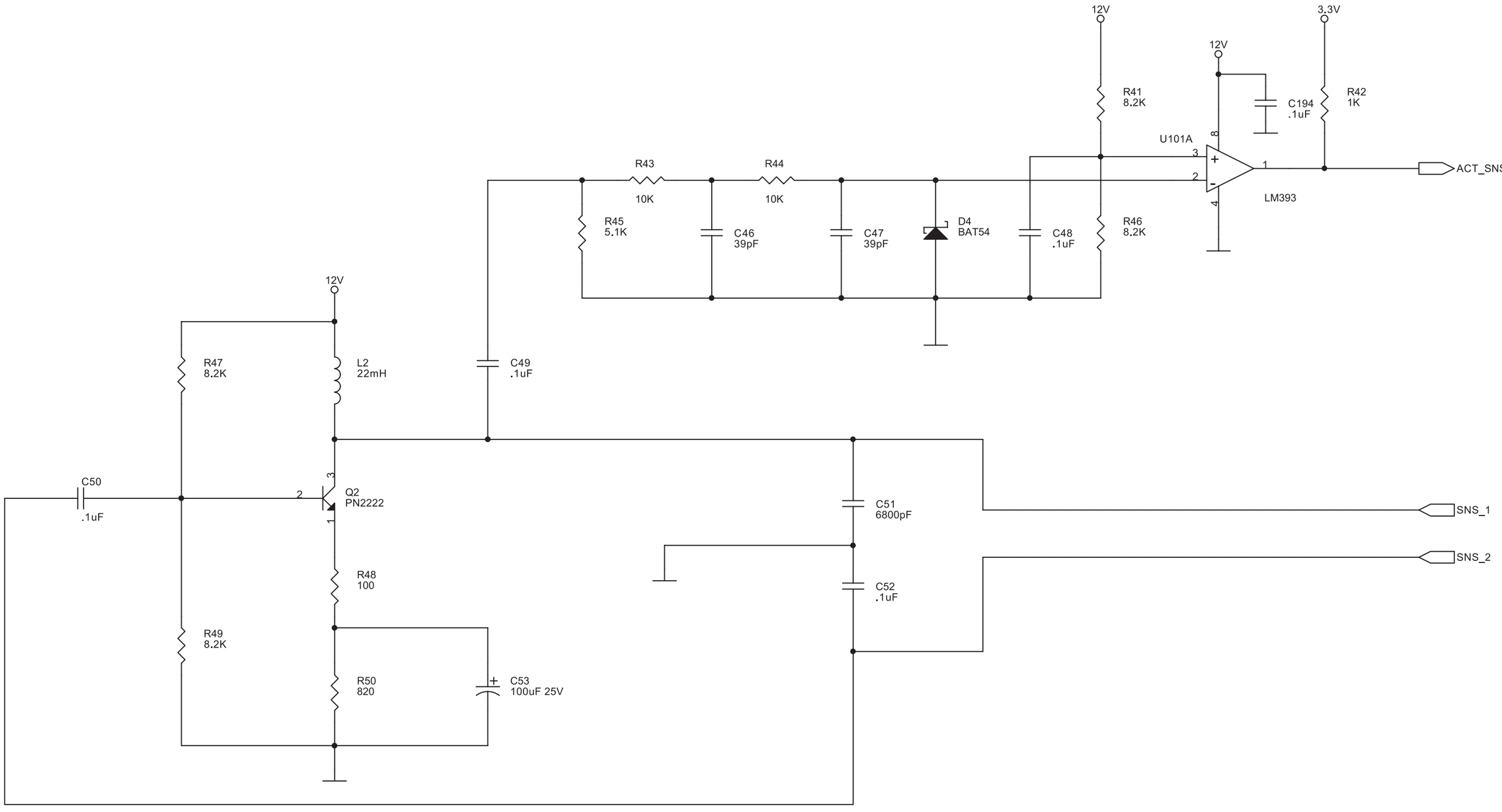
Request Sense Hand Cut Circuit



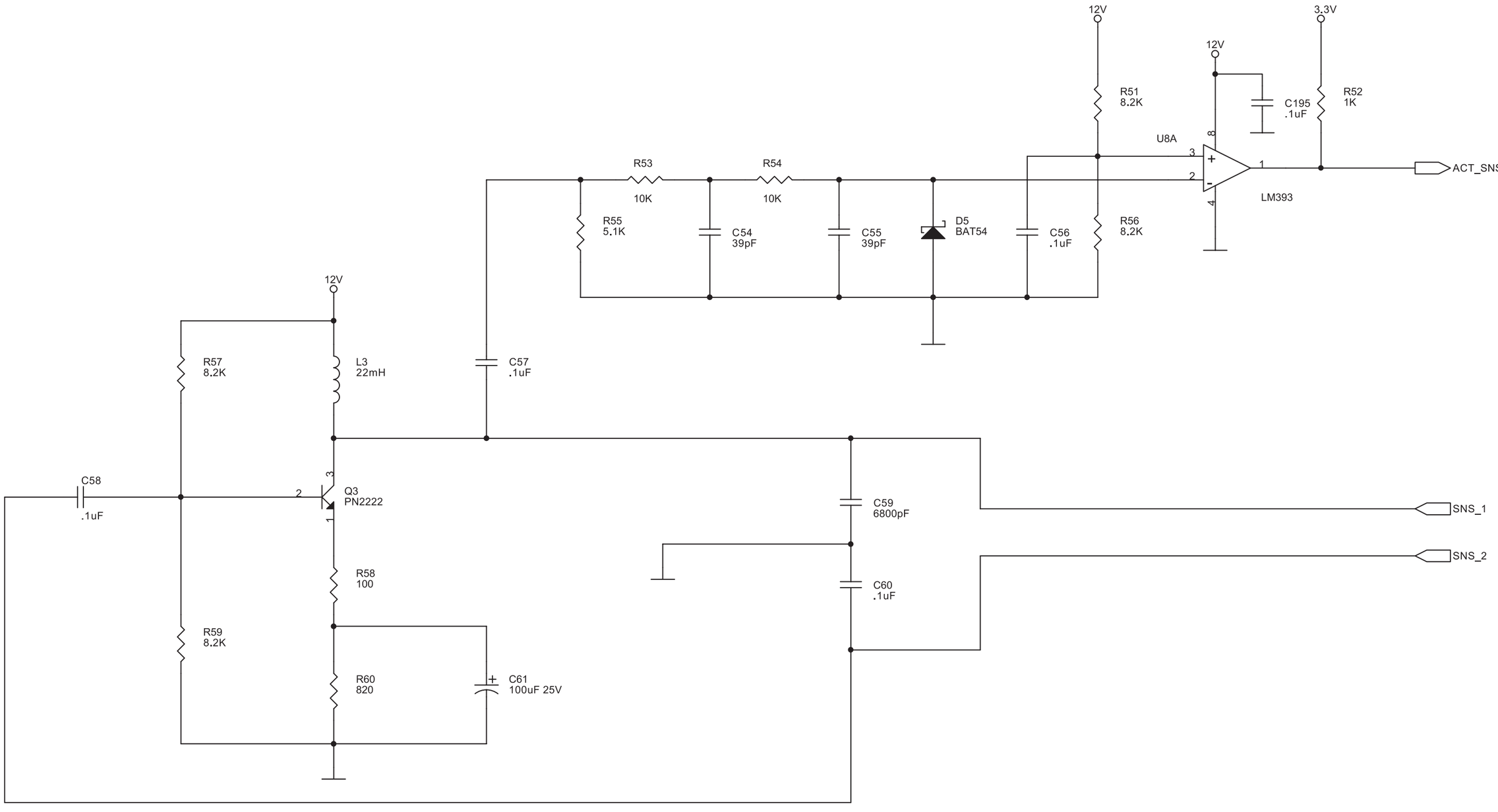
Request Sense Hand Coag Circuit



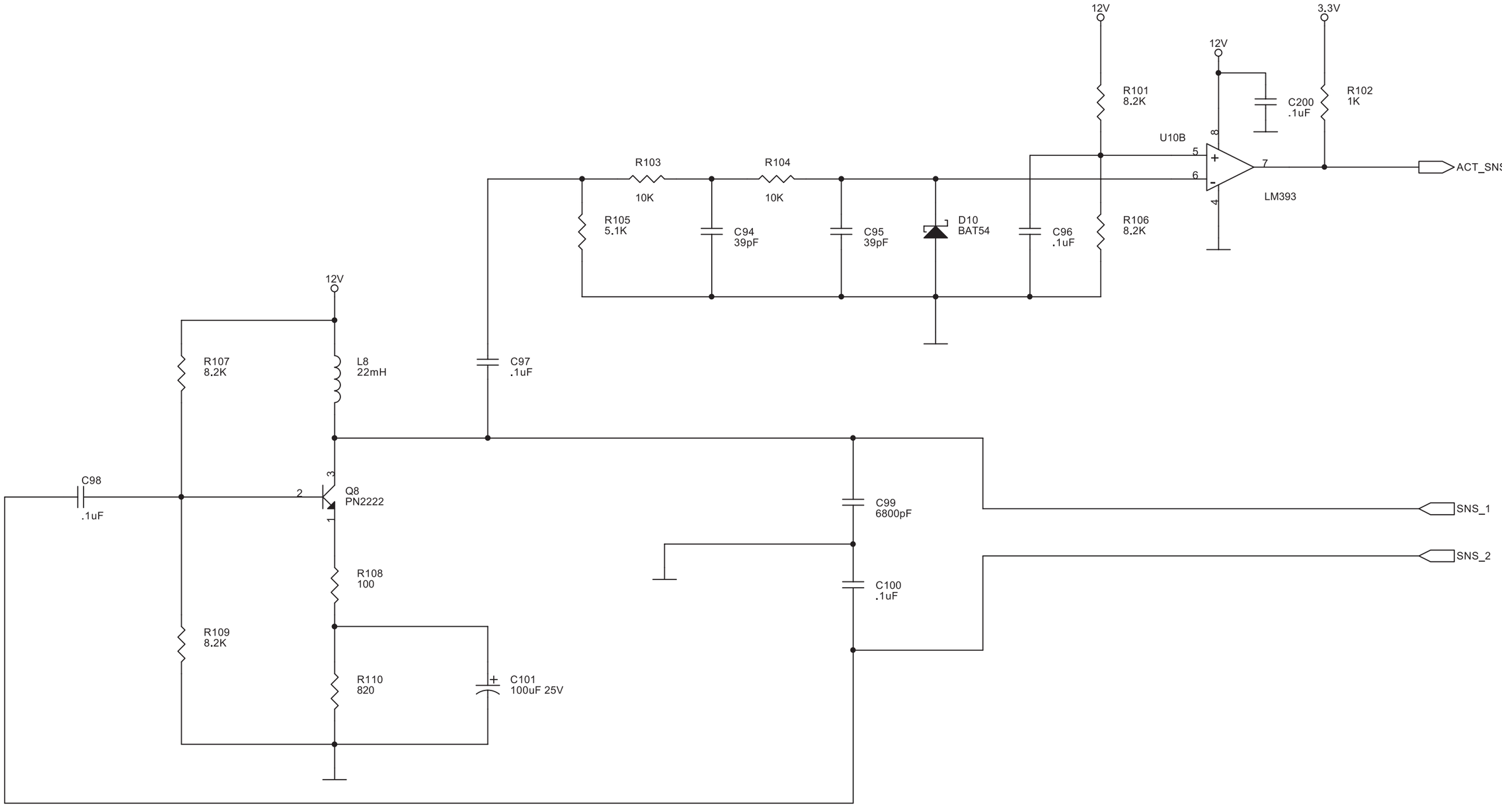
Request Sense Foot Cut Circuit



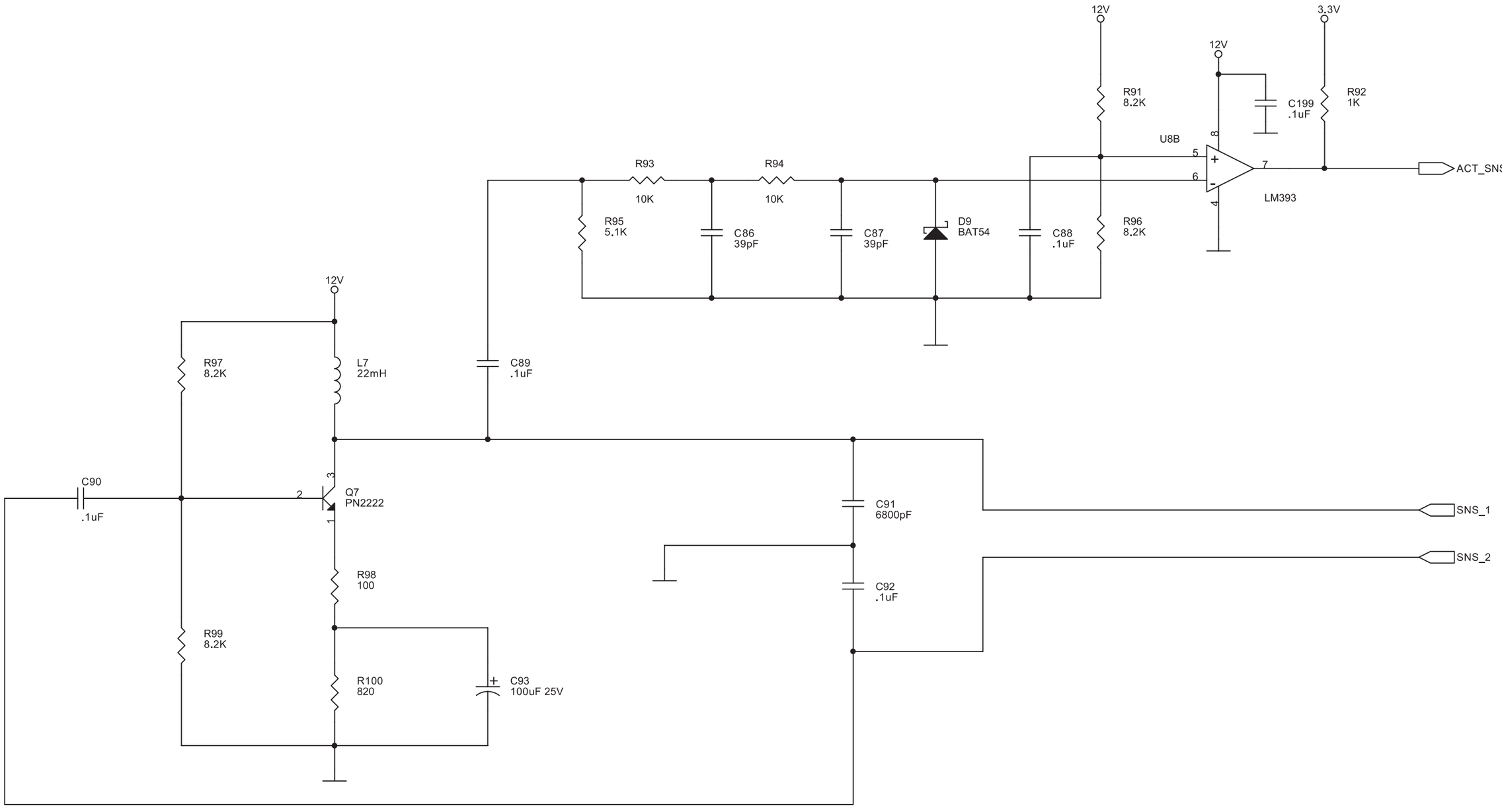
Request Sense Foot Coag Circuit



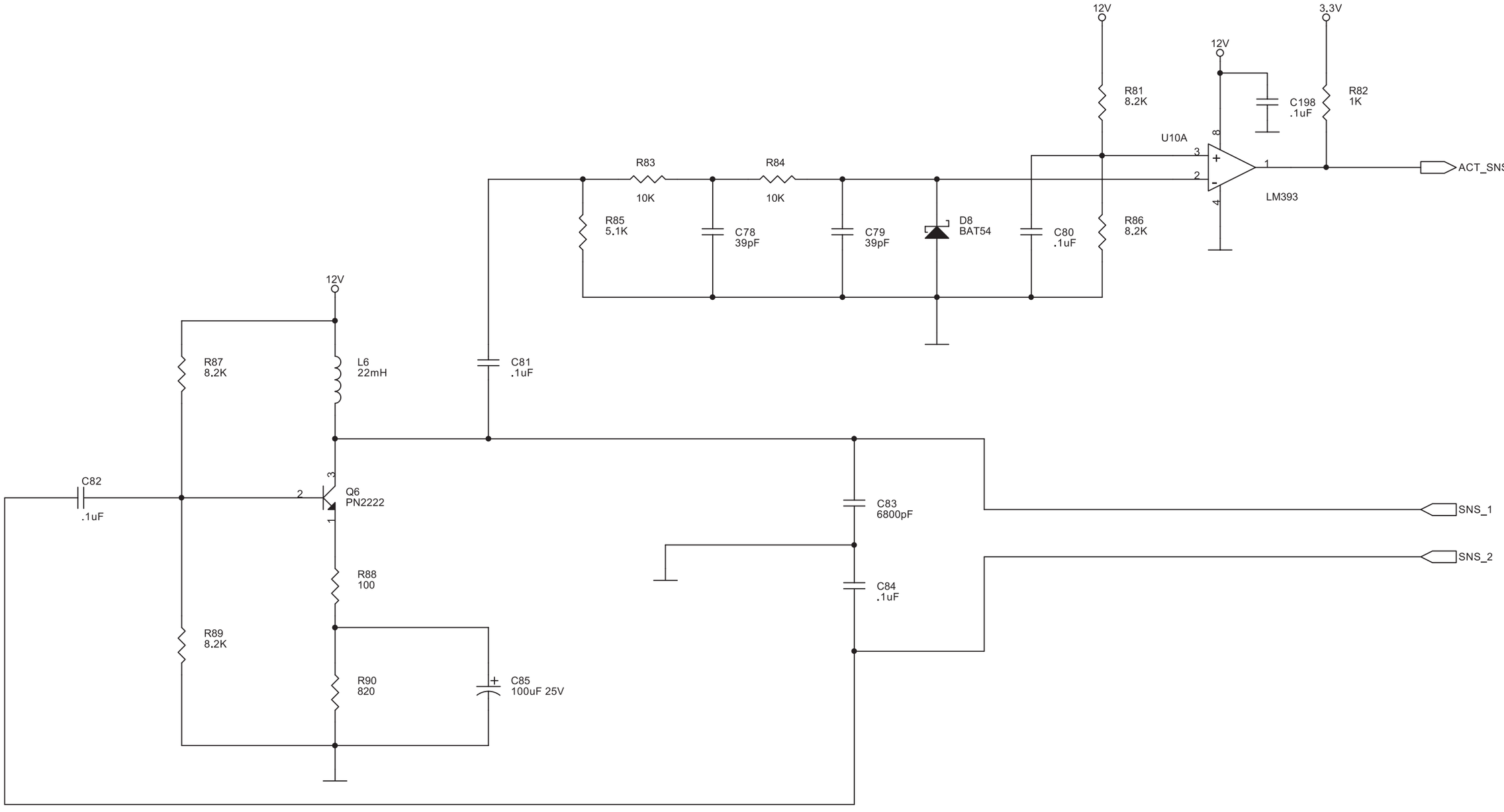
Request Sense Foot Bipolar Circuit



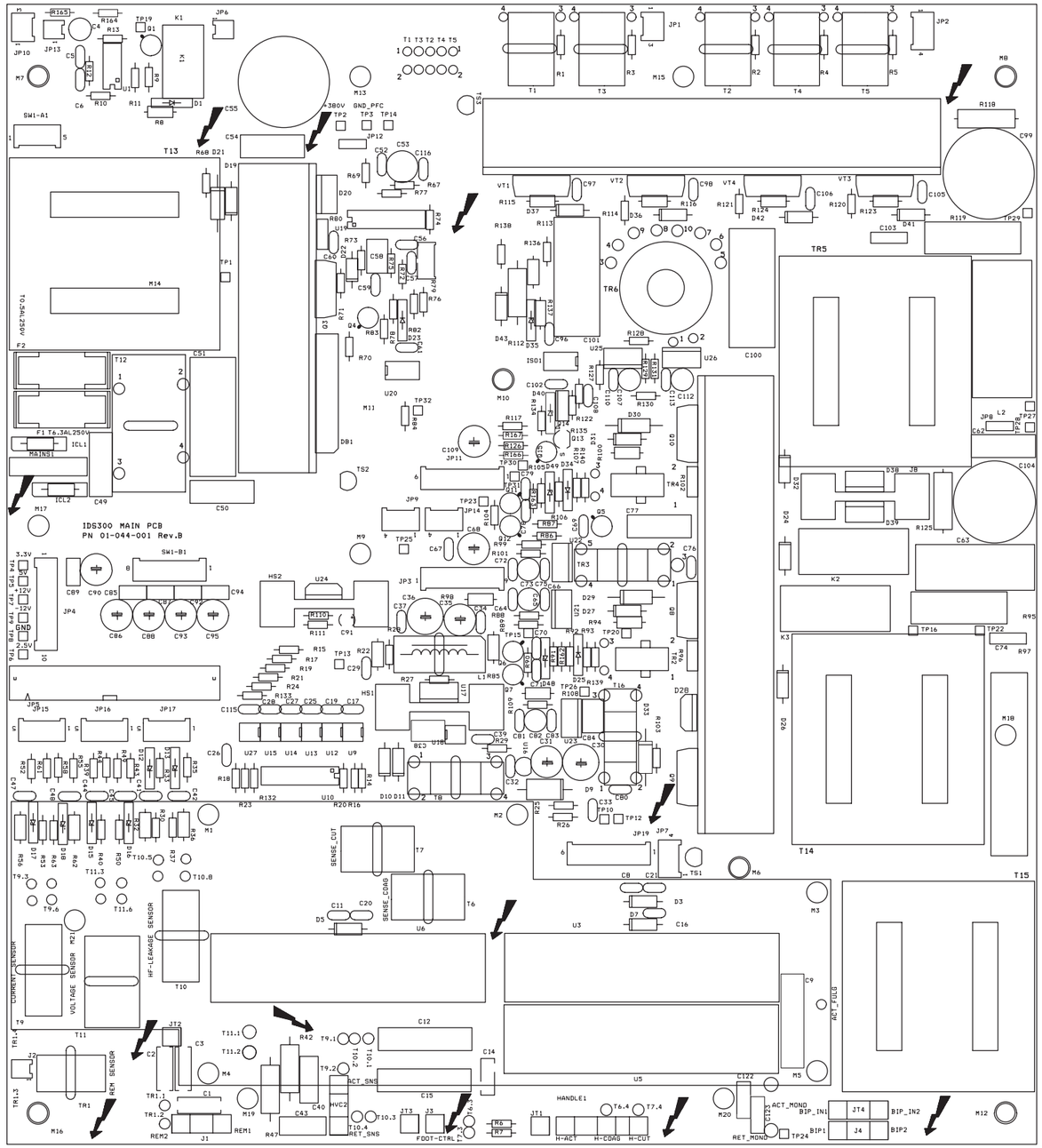
Foot Monopolar Contact Circuit



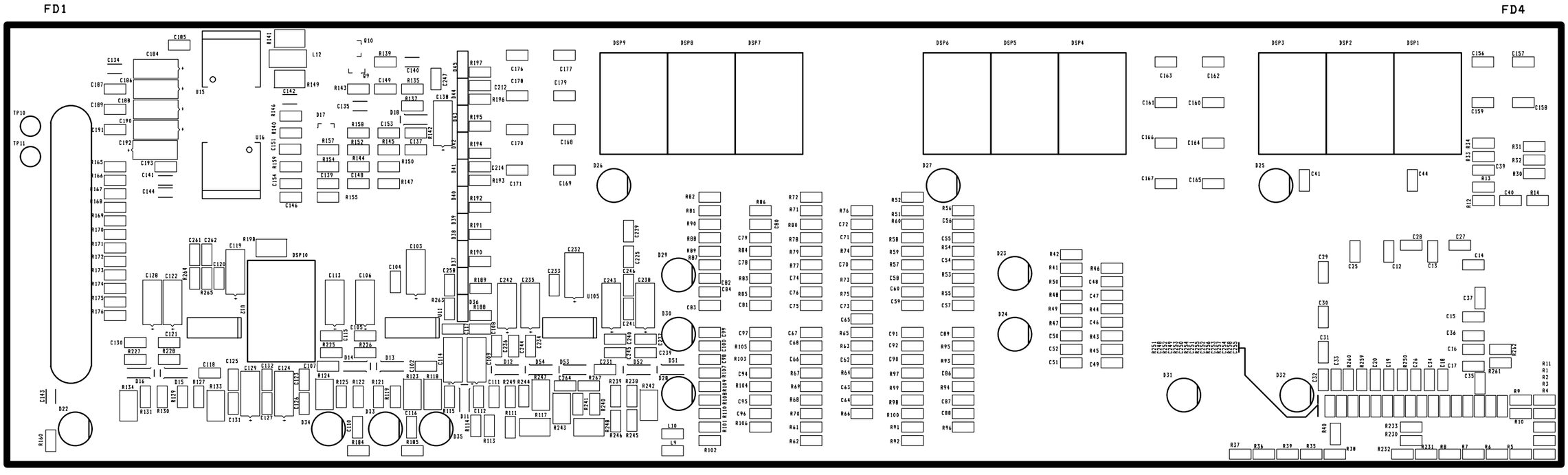
Foot Bipolar Contact Circuit



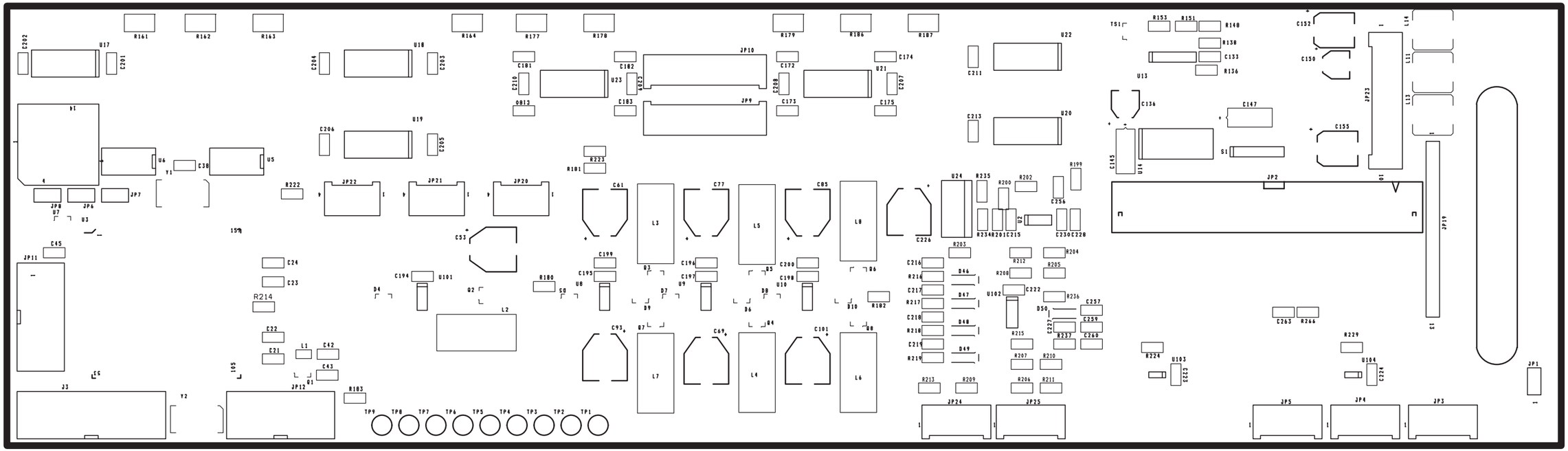
Silkscreen for Main PCB for Component Locations



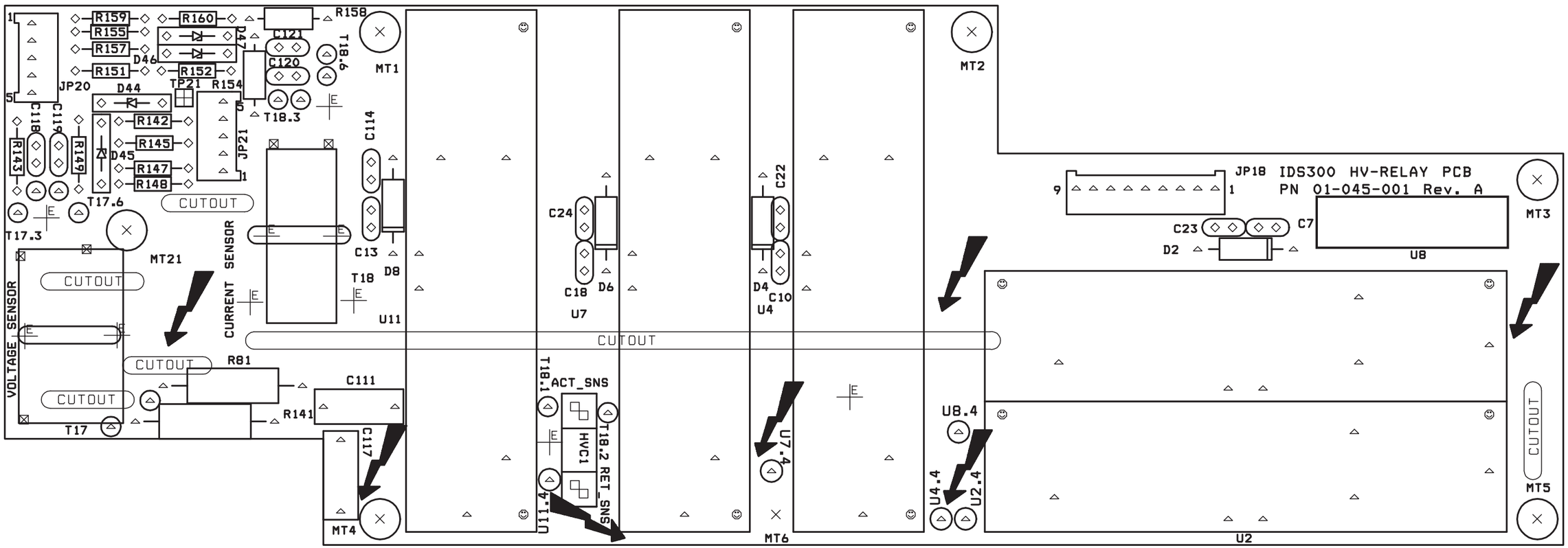
Silkscreen for Top of Display PCB for Component Locations



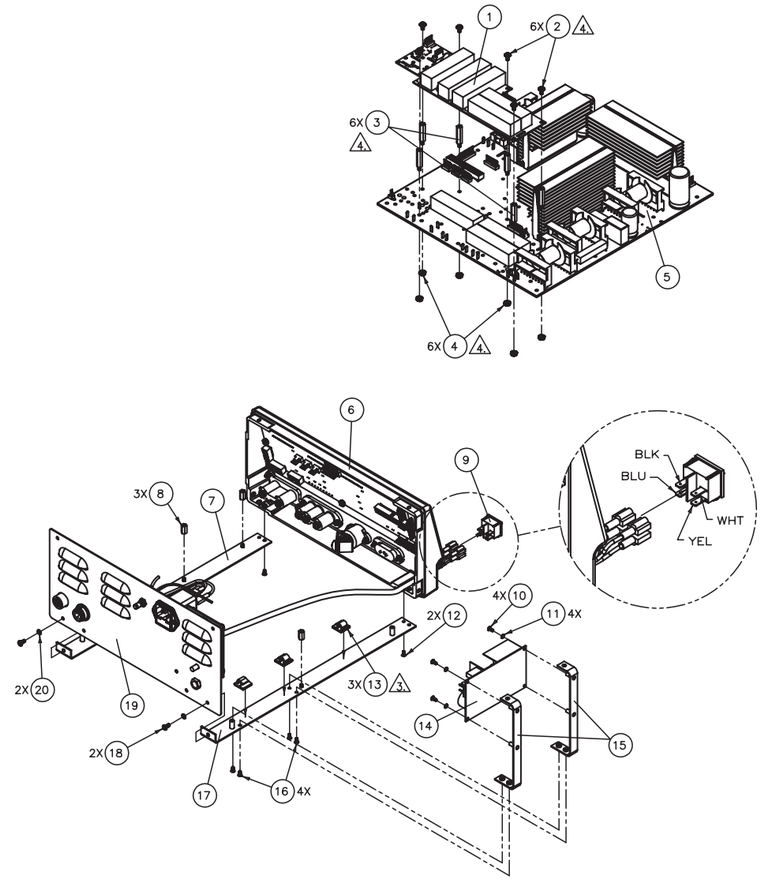
Silkscreen for Bottom of Display PCB for Component Locations

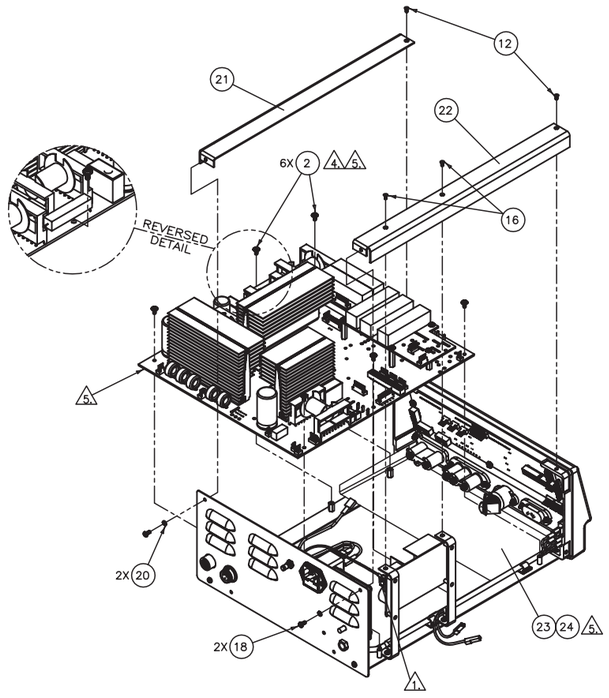


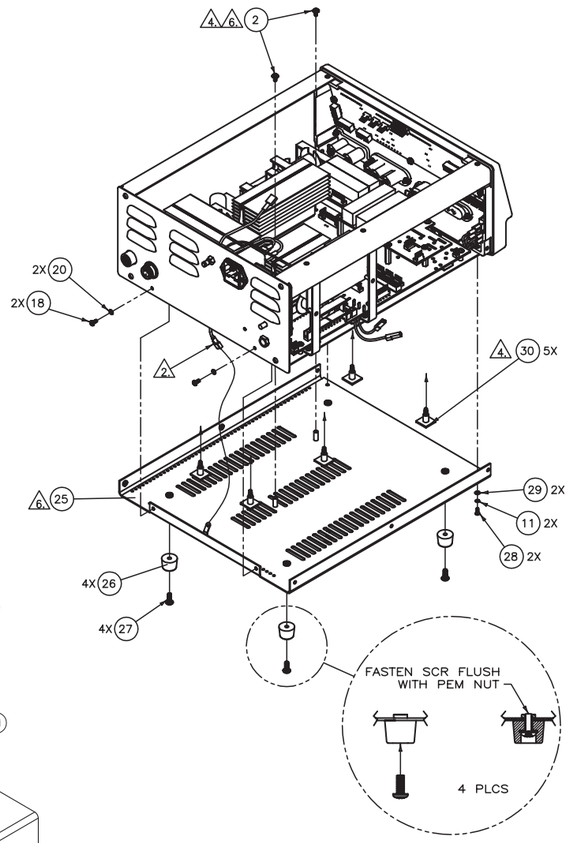
Silkscreen for Relay PCB for Component Locations

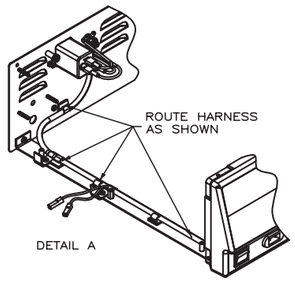


Final Assembly Overview

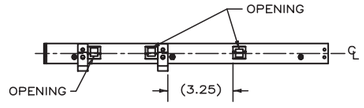




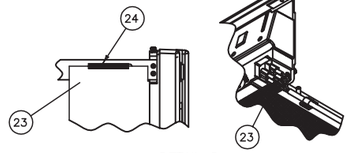




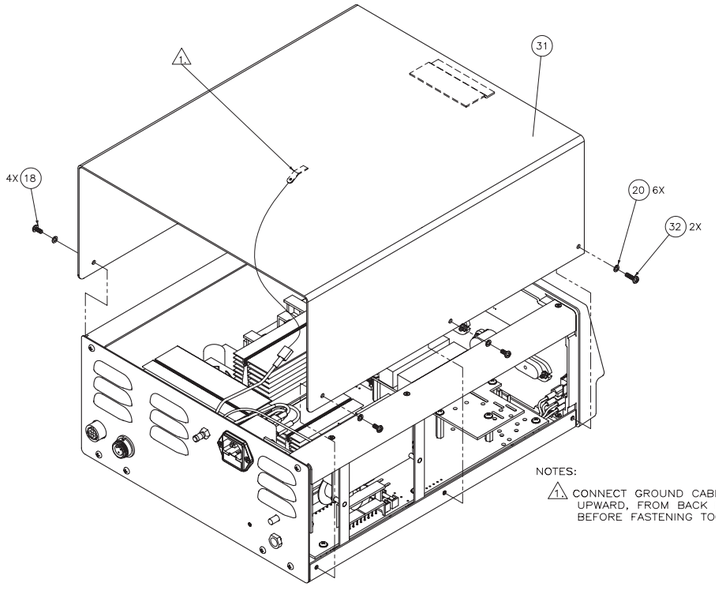
DETAIL A



DETAIL B



DETAIL D

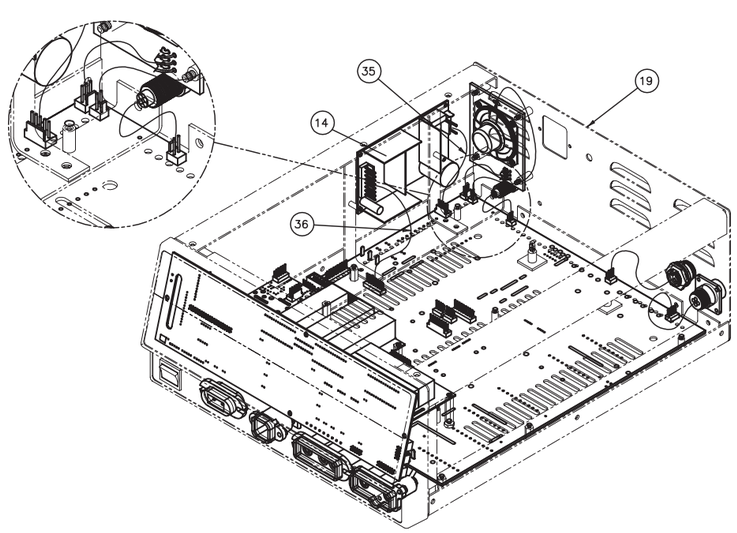


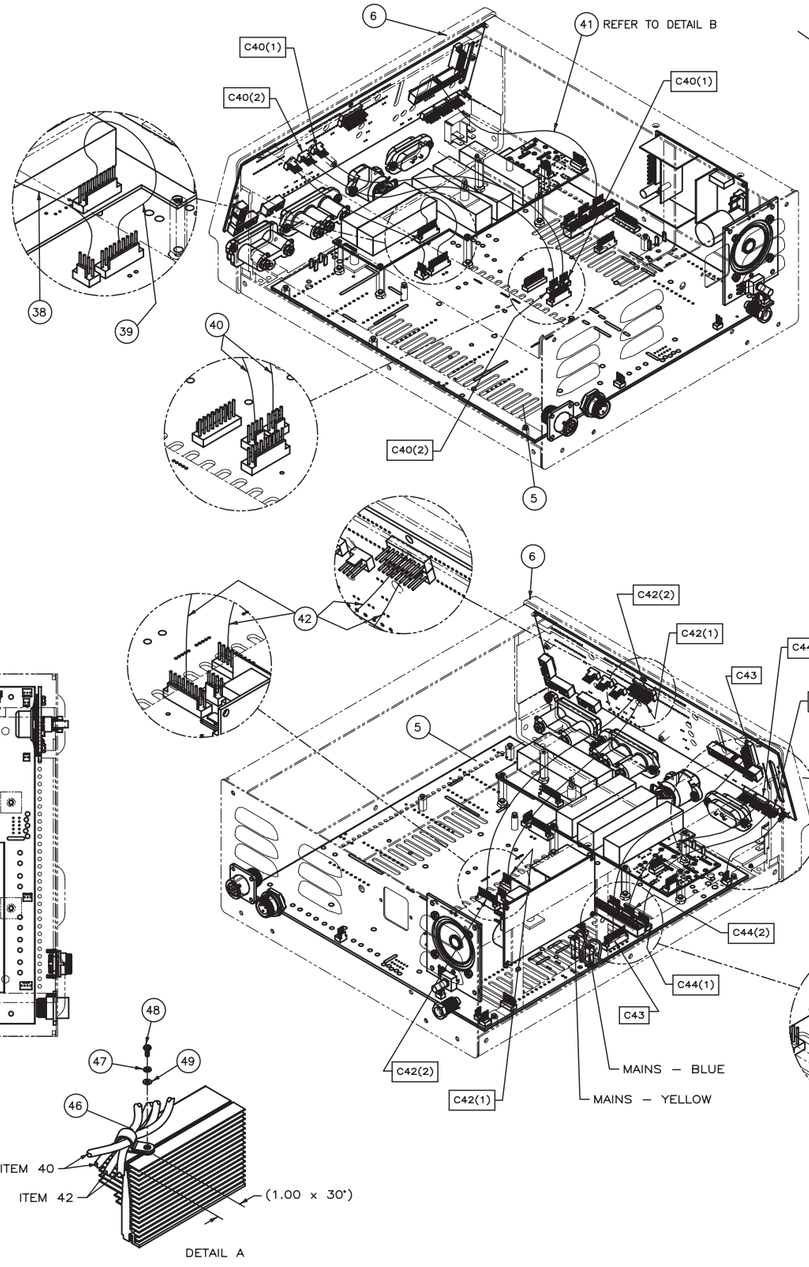
NOTES:

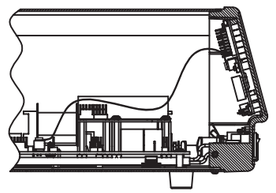
1. CONNECT GROUND CABLE, INDICATED BY THE ONLY ONE ROUTED UPWARD, FROM BACK PANEL TO OUTER COVER (ITEM 31) BEFORE FASTENING TOGETHER.

Cabling in Assembly

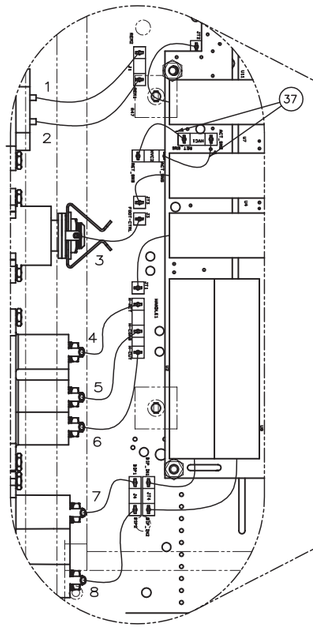
Refer to page B-4 for list of cables

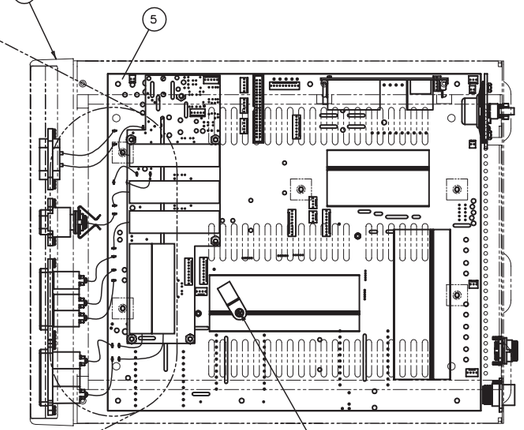






DETAIL B
RIBBON CABLE
ROUTING, ITEM 41

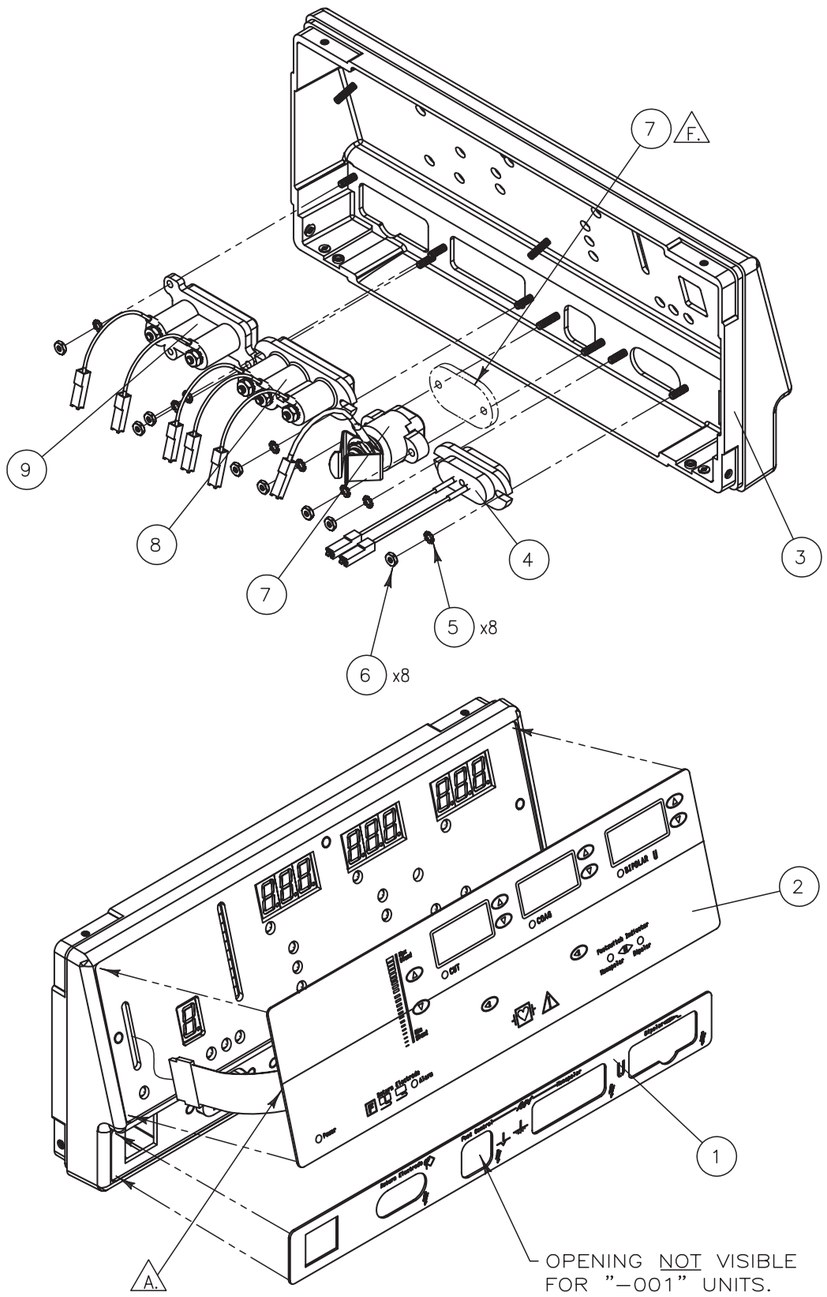


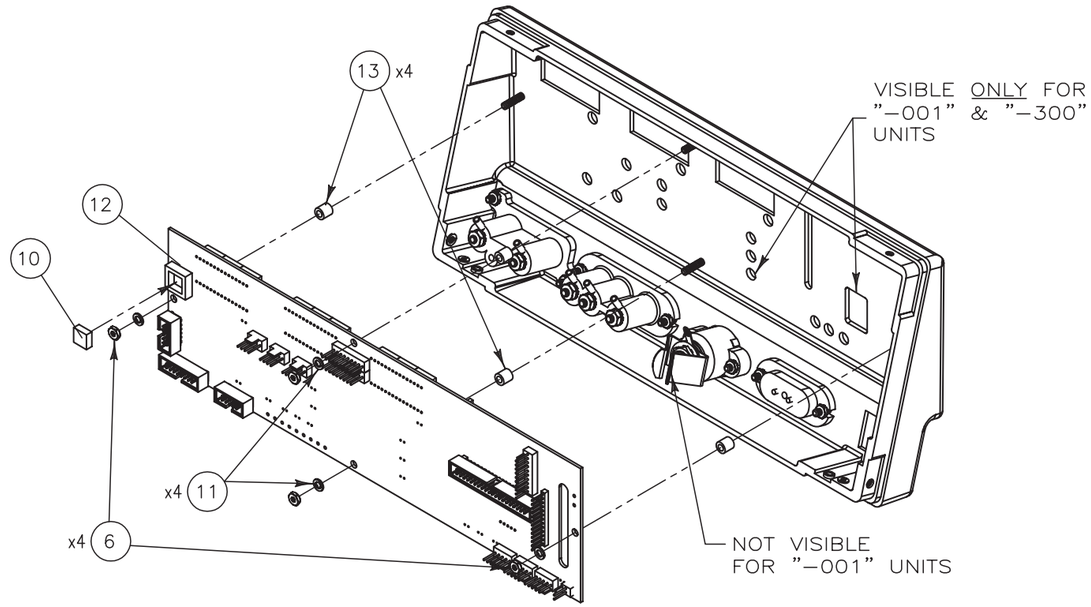


ROUTE FOUR WHITE CABLES (ITEMS 40 & 42)
THROUGH CABLE CLIP (ITEM 46) AND MOUNT TO
HEATSINK AS SHOWN IN DETAIL "A"

DETAIL A

Mechanical Front Panel Assembly





NOTES:

1. TORQUE FOR ALL 6–32 NUTS IS 7 LBS/IN.

ASSEMBLY INSTRUCTIONS:

A. PEEL OFF ADHESIVE BACKING ON TOP OVERLAY (ITEM 2). (*IMPORTANT* ALSO PEEL OFF THE SMALL PIECE OF ADHESIVE BEHIND THE FLEX CABLE.), SLIDE OVERLAY CABLE THRU SLOT IN THE UPPER HALF OF FRONT PANEL (ITEM 3), AFFIX TOP OVERLAY (ITEM 2) TO THE UPPER HALF OF FRONT PANEL (ITEM 3).

B. ATTACH CONNECTORS (ITEMS 4,7,8,& 9) TO FRONT PANEL MOLDING (ITEM 3). DO NOT TIGHTEN NUTS (ITEM 6) TO FRONT PANEL (ITEM 3).

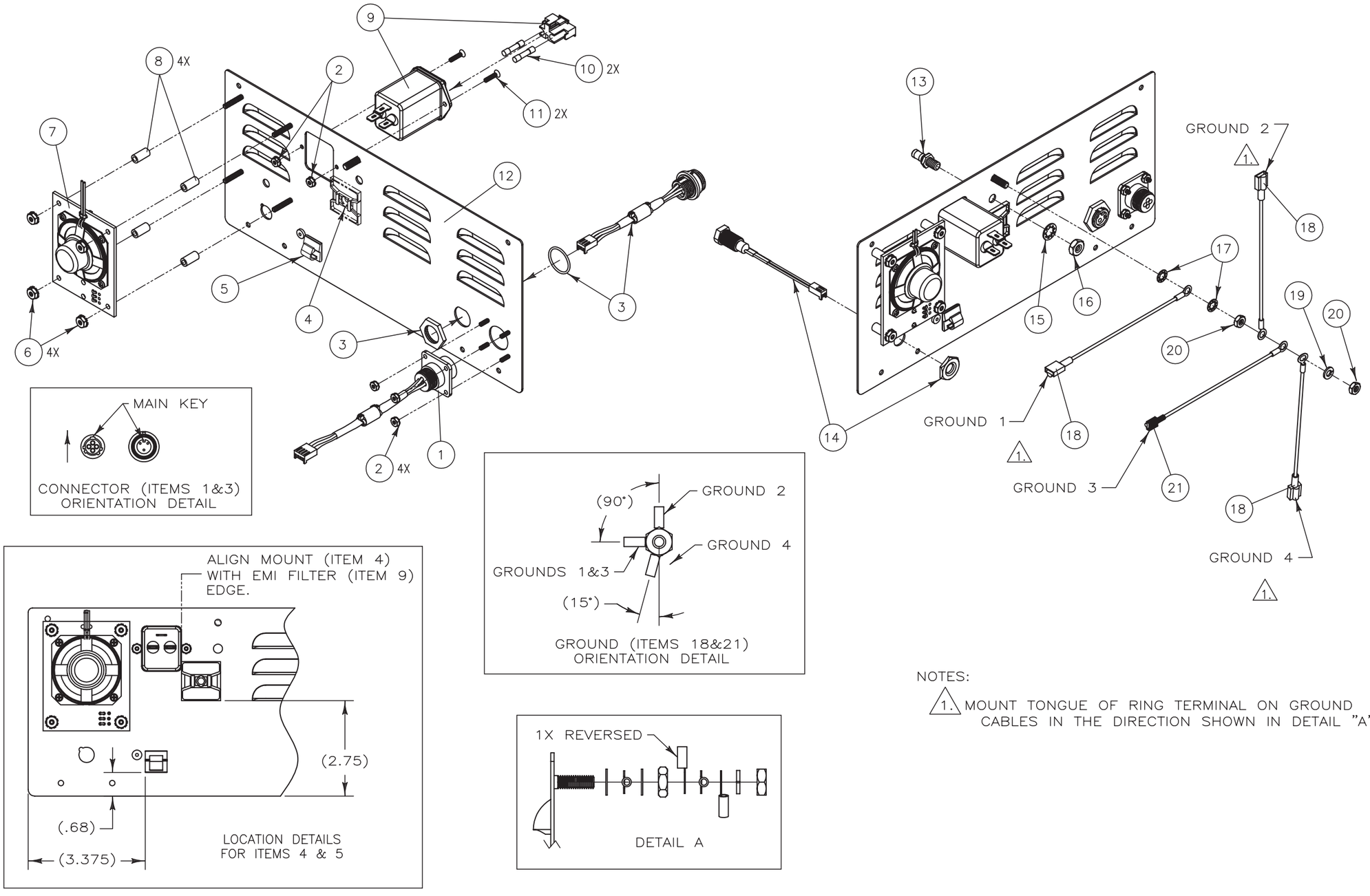
C. PEEL OFF ADHESIVE BACKING ON BOTTOM OVERLAY (ITEM 1) AND AFFIX TO THE LOWER HALF OF FRONT PANEL (ITEM 3). AFTER OVERLAY IS IN PLACE, TIGHTEN ALL CONNECTORS MENTIONED IN STEP "B".

D. ATTACH DISPLAY PCB (ITEM 12) WITH STANDOFFS (ITEM 13) TO FRONT PANEL MOLDING (ITEM 3).

E. ATTACH OVERLAY FLEX CABLE ONTO BACK OF DISPLAY PCB (ITEM 12).

F. DETAIL SHOWN (P/N: 06–078–001) IS ONLY A REPLACEMENT PART FOR ITEM 7 ON "–001" UNITS.

Mechanical Back Panel Assembly



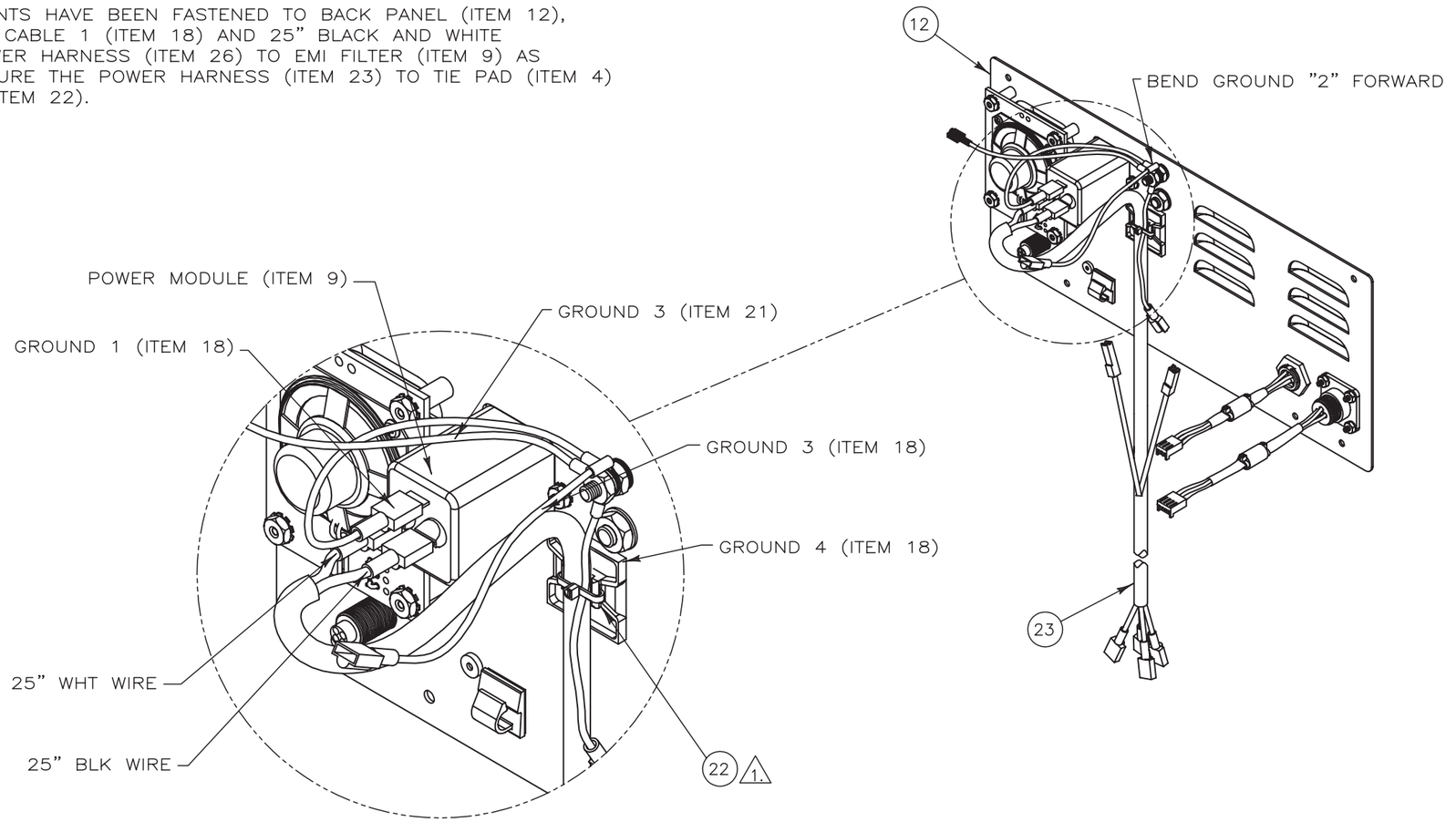
NOTES:

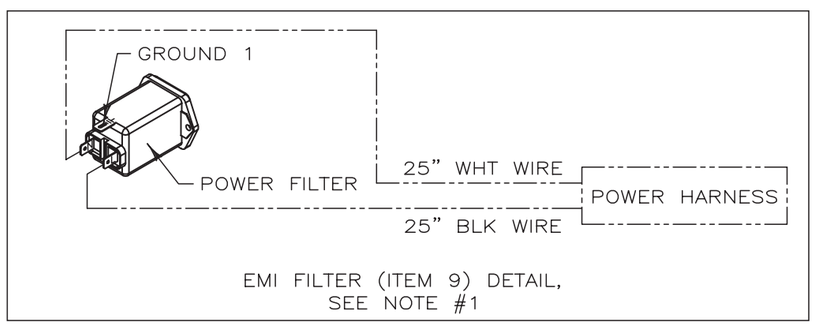
1. MOUNT TONGUE OF RING TERMINAL ON GROUND CABLES IN THE DIRECTION SHOWN IN DETAIL "A".

Cabling Back Panel Assembly

NOTES:

1. WHEN ALL COMPONENTS HAVE BEEN FASTENED TO BACK PANEL (ITEM 12), CONNECT GROUND CABLE 1 (ITEM 18) AND 25" BLACK AND WHITE CABLES FROM POWER HARNESS (ITEM 26) TO EMI FILTER (ITEM 9) AS SHOWN. THEN SECURE THE POWER HARNESS (ITEM 23) TO TIE PAD (ITEM 4) USING TIE WRAP (ITEM 22).





EMI FILTER (ITEM 9) DETAIL,
SEE NOTE #1